Government of Canada
Department of Communications
Canadian Workplace Automation Research Centre
Organizational Research Directorate

INTRODUCTION AND USE OF COMPUTERS IN SMALL BUSINESSES: A STUDY OF THE PERCEPTIONS AND EXPECTATIONS OF MANAGERS

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Laval
February 1987

MCC-CWARC-DLR-85/6-009

90-02331/

This report, done by the Centre des dirigeants d'entreprise, was commissioned by the Organizational Research Directorate, Canadian Workplace Automation Research Centre, Department of Communications, Government of Canada. The views expressed in this report are those of the authors.

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Cat. No. Co28-1/12-1988E

ISBN 0-662-16254-4
(Original version: ISBN 0-662-94942-0, CCRIT, Laval)

*Summary available in French or English.
*The complete report is available in French or English.

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I INTRODUCTION

1. Historical background

In August 1985, the Centre des dirigeants d'entreprise (CDE) submitted a research project to the Canadian Workplace Automation Research Centre (CWARC) to determine how computerization might be made more attractive and accessible to small business. More specifically, the main objective of this research was to deal with "**the analysis of the needs and perceptions of small business managers with respect to introducing information technology as a management tool.**" The second objective was to "study the impact of the introduction of automated office tools in small businesses, taking into account certain regional disparities and differing sectors of activity."[1]

In this spirit, and as requested by the CDE and CWARC, the members of the Working Group on Technology Management (Groupe de Recherche sur la Gestion de la Technologie - GRGT) of the Department of Administrative Studies at the Université du Québec à Montréal submitted a proposal in January 1986 that would provide insight into some of these questions.

For the purposes of this research project, it was agreed that the term "office automation" would be used in the broadest sense. It was also agreed that the target population would be limited to small businesses with less than 100 employees. This latter decision was justified by the relatively small sample used and by the widely varying profiles of the businesses involved regarding their use of computer systems."

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1. Research project submitted to CWARC by the CDE in August 1985. See articles by the authors published in the November 1985 and April 1986 issues of Gestion.

2. Research objectives

The modified research project submitted to the CDE featured two main objectives.

- To measure the perceptions and expectations of small business managers regarding the introduction and use of computer technology in their businesses. Complementing this would be a study of the satisfaction of managers regarding the introduction and use of computers in their business.

- To identify a number of businesses whose managers would be interested in actively participating in an experiment to implement computer systems in a controlled setting.

These objectives were pursued taking into consideration current knowledge in the field and using a conceptual framework developed by the authors and presented in this document.

3. Definitions

If research results are to be accurately interpreted, the terms used in this research must be clearly defined and understood. It should be noted that the definitions proposed here are those of the authors, and may differ from those found elsewhere in the literature.

Information technology

Refers strictly to technologies used for processing management information.

Does not include technologies associated with the field of production or computer-integrated production (e.g. robotics).

Small business

Business employing a total of fewer than 100 persons.

Manager

May be the owner, co-owner, partner, general manager, president or any other person whose decision-making function is that generally associated with a manager.

4. Theoretical framework

Conducting research on the perceptions of business managers regarding the introduction and use of computers in their businesses is a relatively new approach. It is nevertheless commonly accepted that the successful implementation of information systems in business is closely linked to the commitment of administrators and managers (Lucas, 1985, King and Rodriguez, 1978) particularly in the case of small businesses. There are a number of studies on how employees perceive the introduction of computers in businesses (Cheney, 1983, Zuboff, 1983), but we found only one that dealt exclusively with how managers perceive it. The study conducted by Malone in 1984 dealt with 10 owner-managers of small businesses specializing in retail sales of construction materials, that is, the sales sector. Unfortunately, few variables were studied, and the results, even in the author's view, were difficult to generalize, given the specific nature of the sample. The study nevertheless showed that the perception of management may be quite different from that of employees and that it is of prime importance in making the decision whether or not to computerize. We consequently begin with the premise that the perception a small business manager has of information technology is a crucial factor in the introduction and continued use of computers in that business.

If we recognize that the manager's perception is important, it becomes necessary to identify the variables that enable us to measure this perception. We have identified two main types: "time" variables and "context" variables. For the second type, the context was obviously related to the organization and to technology and its use; in other words, these are organizational, technological and operational variables. For each of these groups, we identified and defined a number of questions, and these are presented in detail in Part III of this report.

"Time" variables have been identified in works on this subject as being essential to an understanding of how computerization evolves within the business. Many authors, notably Nolan (1973) and McKenney and McFarlan (1982), have proposed models of information technology evolution in businesses, but these models cover only the post-implementation phase. We felt it was important to better understand what goes on during the design or pre-introduction phase, so as to assess any differences between expectations stated during that phase and the situation in which managers find themselves once computer systems have been implemented in their organizations.

All these variables may be combined to make up the conceptual model shown below:

CONCEPTUAL MODEL OF RESEARCH

	before technology introduction	first year of introduction	subsequent years
ORGANIZATIONAL VARIABLES			
OPERATIONAL VARIABLES			
TECHNOLOGICAL VARIABLES			

Briefly, organizational variables are related to the decision-making process and organizational impacts, while operational variables have to do with the operations the system must perform, and technological variables deal with the more technical aspects of the equipment or technology used.

In order to discuss perceptions in the proper context, it seemed essential to have a good understanding of the businesses, their managers and the use currently made of automated systems in the businesses selected. This allowed us to determine whether there were differences in behavior depending on various characteristics of managers and according to the history of computer use in these businesses.

II METHODOLOGY

In order to satisfy the objectives of this research, we opted for a strategy using two differing but complementary approaches to data collection: the first was based on individual interviews, while the second used group interviews. We will discuss these methods further in the section entitled "Data Collection," but for the time being we will maintain this distinction, as it influences the various methodological stages dealing with sampling, coding and data analysis.

Part II is divided into five sections, each of which describes an important aspect of this project. Each section should be read carefully, as the results are analyzed and interpreted on the basis of methodological considerations. The five sections are:

1) Sample
2) Data collection
3) Coding
4) Data analysis
5) Limitations and constraints

1. Sample

1.1 Individual interviews

At the outset, it was decided that the sample would be made up of 40 managers whose companies possessed and used computer equipment for management activities. In order to satisfy certain research objectives, however, we decided to increase this figure to 45 by including five companies that were on the point of computerizing and had thus never operated in a computerized environment.

It was also decided to consider certain additional characteristics of these companies, such as sector of activity and size (in terms of number of employees). These characteristics traditionally explain some variations in the use made of computers.

The 45 companies were broken down according by sector and size. To ensure that our sample was fairly representative of the distribution of Quebec companies, we obtained from Quebec's inspector general of financial institutions the breakdown of companies as it appears in the February 1986 version of the central registry of companies (see Appendix 1, Table A). This table enabled us to determine the percentage distribution of companies by size and sector of activity.

The third characteristic of these organizations was geographical distribution. In order to reflect Quebec's regional disparities, it was decided to choose 30 businesses in the Montreal area (within a 60-km radius of the downtown area) and 15 companies[1] located in other regions of Quebec, that is, Hull, Chicoutimi, Trois-Rivières, Rimouski and Quebec City.

At this stage, we thus had sufficient information to classify our 45 businesses, with the exception of one element that was intended to reflect the degree of computerization of companies by size and sector of activity. We felt it was necessary to take this element into account, as we were dealing mainly with companies which already had and used computer equipment. This information was obtained from another survey we had carried cut among 850 Quebec[2] companies, which provided the most recent statistics on this aspect.

Table 1 shows the breakdown of the proposed sample. This distribution was prepared using the factors listed in Figure 1.

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1. This distribution was determined using statistics on the distribution of Quebec companies as prepared by the inspector general of financial institutions for Quebec. See Appendix 1, Tables A, B and C.

2. See Appendix 1, Table D.

Figure 1 Factors used to establish sample

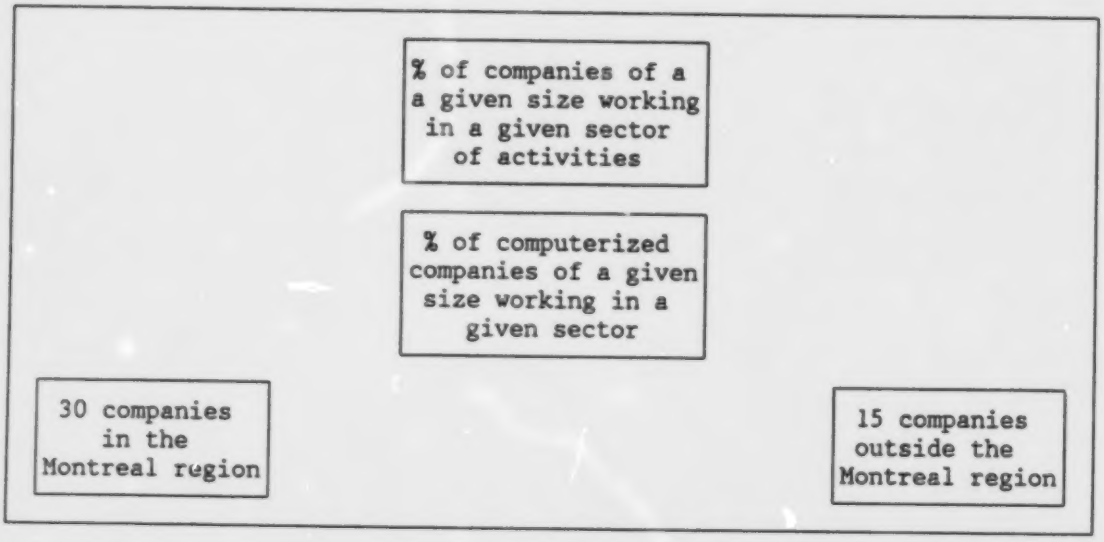
% of companies of a a given size working in a given sector of activities
% of computerized companies of a given size working in a given sector
30 companies in the Montreal region
15 companies outside the Montreal region

Table 1

Proposed sample by size, sector of activity and geographic location of company

SIZE	COMPANIES											
	SERVICE			SALES			MANUFACTURING			TOTAL		
	M[1]	OM[2]	TOTAL	M	OM	TOTAL	M	OM	TOTAL	M	OM	TOTAL
1-19	10	3	13	6	3	9	3	1	4	19	7	26
20-49	3	2	5	2	2	4	2	1	3	7	5	12
50-100	2	1	3	1	1	2	1	1	2	4	3	7
Total	15	6	21	9	6	15	6	3	9	30	15	45

1. Montreal region (60-km radius)
2. Outside Montreal region

Companies were chosen from several sources: first from the list of member companies of the CDE and then from telephone books, various other directories and the Better Business Bureau. In both cases, the selection was random.

Table 2 shows the breakdown of the companies that participated in the survey.

Table 2

Respondent population[1]
by size, sector of activity
and geographic location of company

	COMPANIES											
	SERVICE			SALES			MANUFACTURING			TOTAL		
SIZE	M[2]	OM[3]	TOTAL	M	OM	TOTAL	M	OM	TOTAL	M	OM	TOTAL
1-19	5	3	8	0	2	2	2	0	2	7	5	12
20-49	5	2	7	5	4	9	2	1	3	12	7	19
50-100	4	1	5	2	1	3	4	1	5	10	3	13
Total	14	6	20	7	7	14	8	2	10	29	15	44

1. Population of respondents chosen for statistical analysis. In all, 46 companies participated, but two of these had to be excluded as the respondent could not be considered the manager of the company.
2. Montreal region, 60-km radius.
3. Outside Montreal region.

It will be seen that the distribution of these companies by sector of activity is similar to the proposed sample; however, there are major differences in the size distribution. These are mainly due to the time constraints involved in collecting data, as well as difficulties encountered by researchers in identifying managers of businesses that were already computerized and convincing them to participate in the survey. It seemed that managers of companies with less than 20 employees were the least available, no doubt due to pressure of work. The size distribution of the companies consulted may,

however, be considered adequate for dependable data analysis and interpretation as we obtained 12 or more companies were obtained in each cases. The list of participating managers is given in Appendix 2.

1.2 Group interviews

It was established at the outset that, for group interviews, three interviews would be organized, one for each of the main sectors of activity: service, sales and manufacturing.

Four to seven managers of companies in a given sector were chosen at random for each interview. Size and geographic location were not considered in making the selection, it was based strictly on sector of activity. As it turned out, each of the three groups included managers from companies in the various size categories.

2. Data collection

As mentioned above, data were collected in two stages, using two different methods: individual interviews and group interviews.

We feel that these two methods complement one another and give a more precise idea of the problem. It should be recalled that the project was to study business managers' perception of the introduction and use of computer technology in their companies, and that this subject involves many variables and factors that are difficult to identify and define in principle. The choice of two methods for data collection reduces these constraints to a certain extent and allows for a broader interpretation of results.

2.1 Pretest

The choice of a questionnaire as a survey tool seemed a natural one, given the objectives of the research and the means placed at our disposal to conduct it.

The questionnaire was prepared to satisfy the research objectives and was submitted to a dozen individuals working in the small-business sector. Also, it was tested through an in-depth interview with one company manager in the presence of the senior researchers.

This pretest enabled us refine the questionnaire and produce the final version, which appears in Appendix 3.

2.2 Individual interviews

These interviews were conducted with 44 company managers using an indirectly administered questionnaire. The questions were covered during an interview, with the two interviewers filling in the questionnaire afterwards. All interviews were recorded enabling interviewers to concentrate on the questionnaire and ensure that managers answered all the questions.

The questionnaire was relatively structured, but nevertheless allowed the respondent to reply freely, as it included a number of open and semi-open questions; however, the large number of closed questions made it possible to obtain the factual information needed for the research.

Each interview lasted between one and two hours and involved the manager and two research assistants familiar with the purpose of the survey and the overall conceptual framework of the research. These individuals had received specific instructions on how to conduct the interview and record the results.

All interviews were held in April and May 1986.

2.3 Group interviews

The group interviews were directed by the three senior researchers who used the questionnaire as a guide to discussion. These interviews lasted approximately two hours and were held on May 13, 14 and 15, 1986, at a dinner/discussion meeting. The results of each of the three group interviews were compiled and transcribed by the two research assistants who were present during the interviews and then checked by the senior researchers.

At the beginning of each interview, managers were asked to identify their company and describe how computers were introduced and used. The discussion then turned to perceptions and expectations in terms of the variables selected for the research. At this stage, the form was really that of a discussion meeting, with researchers later studying the compiled results to determine the main themes.

3. Coding

As mentioned above, the questionnaire included open, semi-open and closed questions; in other words, it enabled us to collect both qualitative and quantitative information. In all, 175 variables and 1,512 values were coded and processed statistically. A number of the qualitative variables that appeared in the questionnaire were also studied at the same time.

Several measurement scales (Likert nominal and ordinal scales) were used to code the information. All coding operations were checked at least once.

4. Data analysis

The coded data were compiled by computer and processed using SPSS. The qualitative data were analyzed subsequently by the senior researchers to determine the main trends. The results of the quantitative and qualitative data are presented together in Part III of this report.

5. Limitations and constraints

With any methodology, there are normally limitations and constraints that must be taken into account when analyzing and interpreting data.

In our case, the main constraints are due to the size and nature of the sample. The number of businesses involved is too small for us to make any statistical inferences; at most, the results will enable us to describe some trends or hypotheses that may be verified in future research.

This type of research nevertheless has the advantage of providing considerable information on the subject being examined, and it is up to the reader to interpret the results and draw the conclusions that appear most justified.

Regarding the content, it is important to understand that the results of research on perceptions are subjective data that may, in some cases, not correspond to the true situation. The perception of a manager is, after all, only a representation of reality as that person constructs it. It is important to bear this in mind when interpreting results. The managers' perceptions are necessarily influenced in favor of companies. For this reason, it is preferable, in certain cases, to leave aside the absolute values assigned to the different variables and concentrate on the relative values of variables in relation to one another.

III SURVEY RESULTS

This third chapter presents, in detail, the survey results of the managers of 44 Quebec companies.

The first part of the chapter provides a definition of the population surveyed in terms of various organizational and individual characteristics. The second part deals with the current situation regarding the use of computer systems in the businesses involved; this is actually a list of the hardware and software introduced to date in these companies, along with the relevant applications.

The third part describes the perceptions of managers regarding the introduction and use of computers in their businesses. This aspect was, in fact, the most important element of the research project.

1. Respondent population

The population surveyed was made up of managers from Quebec companies that met certain predefined criteria.

The businesses selected all had their head offices in the province of Quebec. Two thirds of them were located in the Montreal region, with the remaining third located in various regions of the province, mainly in Trois-Rivières, Chicoutimi, Quebec City and Rivière-du-Loup. This distribution ensured that the various regions of Quebec were reasonably well represented.

The businesses selected all employed less than 100 people and operated in one of the following three sectors: service, sales or manufacturing. Table 3 shows a breakdown of these companies by size and sector of activity.

Table 3

Distribution of companies
by size and sector of activity

Number of Employees[1]	SECTOR OF ACTIVITY			
	SERVICE	SALES	MANUFACTURING	TOTAL
1 - 19	8	2	2	12
20 - 49	7	9	3	19
50 - 100	5	3	5	13
TOTAL	20	14	10	44

1. Includes full and part-time employees.

It may be seen that most of the businesses are concentrated in the service sector, and the majority employ 20 to 49 employees.

All these organizations, with one exception, were profit-making businesses, with turnover varying considerably, depending on size and sector of activity. For the group employing 1-19 people, average turnover was three times higher in the "sales" sector than in the "service" sector. The effect of size is even more pronounced, although this fact in itself comes as no surprise.

Table 4

Turnover by size and
sector of activity of company

SIZE OF COMPANY (no. of employees)	SECTOR OF ACTIVITY		
	SERVICE $	SALES $	MANUFACTURING $
1 - 19			
average	558,125	1,875,000	825,000
mean	480,000	1,875,000	825,000
20 - 49			
average	6,550,000	4,711,111	4,333,333
mean	1,500,000	2,500,000	3,500,000
50 - 99			
average	16,600,000	13,666,667	7,600,000
mean	5,500,000	16,000,000	7,500,000

Leaving aside the size and sector of activity factors, these organizations may be broken down by turnover as illustrated in Table 5.

Table 5

Breakdown of companies
by annual turnover

TURNOVER $	NUMBER OF COMPANIES
100,000 - 249,999	2
250,000 - 499,999	3
500,000 - 999,999	6
1,000,000 - 4,999,999	18
5,000,000 - 9,999,999	8
10,000,000 and over	7

Based on these statistics, average turnover for all the businesses was $6,207,159, while the median was $2,750,000.

One last important remark about the businesses selected for this survey has to do with the age of the companies. Half of them were formed after 1966, that is, during the past 20 years, while nearly 15% of them have been operating since 1980, thus indicating a relatively young group of companies.

We were also able to establish certain characteristics of the managers[1] of these companies, which may be of some importance in the final interpretation of this research on management perceptions.

In general, the managers of the businesses studied have been with their companies for ten years, with the median year being 1976. Most of them attended university (68%) or CEGEP (16%) (Table 6).

Table 6

Level of schooling
of managers

LEVEL OF SCHOOLING	NUMBER	%
Elementary	1	2
Secondary	5	11
College	7	16
University	30	68
Undetermined	1	2

Closer examination revealed that, in companies with 1 to 19 employees, all managers, without exception, had attended college or university.

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1. See definition p. 3.

2. Computers in small business

Before dealing with the perceptions of management regarding the introduction and use of computers in their companies, it appeared necessary to examine the current level of computerization in these companies. The first step was to describe existing equipment and obtain information regarding its cost and date of acquisition. With regards to software, it was possible to determine whether this was software developed especially for the company or software generally available on the market.

We then identified the chronological order in which the various applications were implemented in the sample as a whole. This enabled us to determine the importance[2] managers attach to these applications.

2.1 Computer hardware

For each company surveyed, the list of computer software[3] included the name of supplier, make and/or model, purchase cost or leasing cost and date of acquisition. The compiled results enabled us to produce tables giving a general idea of the type of hardware preferred by managers.

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2. Importance is measured in terms of utility but also in terms of accessibility of applications.

3. An alphabetical list of hardware is given in Appendix 4.

Table 7 shows a breakdown by type of hardware, defined in terms of computing power: microcomputers, minicomputers and central computer systems. For practical reasons, we wanted to distinguish systems used for word processing, given the specific nature of this equipment.

Table 7

Breakdown of computerized businesses
by type of equipment owned,
company size and
sector of activity

TYPE OF EQUIPMENT	SECTOR OF ACTIVITY				SIZE		
	TOTAL %	SERVICE %	SALES %	MANUF. %	1-19 %	20-49 %	50-100 %
Microcomputers	87	89	83	89	90	94	75
Minicomputers	10	11	17	0	0	18	8
Central computers	10	11	8	11	0	0	33
Word-processing systems	13	22	0	11	10	12	17

It will be noted that over 85% of these companies have microcomputers. This technology is thus widely used in small businesses, particularly in those with less than 20 employees. This confirms the hypothesis that the advent of microcomputers was a contributing factor in the computerization of businesses. In fact, 59% of companies (23 out of 39) using computers operate only with microcomputer technology. Of these 23 companies, 18 have only one microcomputer, three have 2, one has 3 and one has 8. Is this an indication that more microcomputers are being acquired to satisfy the growing need for information processing in businesses? Whatever the case, these statistics show that microcomputers are clearly popular in smaller businesses, that is, those with fifty employees or less.

For those companies working only with microcomputer equipment, the average purchase cost of equipment was $16,914. The distribution of companies by date of purchase of microcomputer equipment clearly illustrates the growing popularity of this type of equipment over the past two years. In fact, any statistics dating back over two years might be significantly skewed judging by the trends indicated by the figures in Table 8, that is, a sharp rise from 1984 on.

Table 8

Distribution of companies[1]
owning microcomputer equipment
by year of purchase[2]
of that equipment

YEAR OF PURCHASE	NO. OF BUSINESSES[3]
1978	2
1981	1
1983	6
1984	21
1985	19
1986[2]	4

1. For companies working only with microcomputer equipment.
2. Since the survey was carried out in April 1986, these figures correspond only to the first four months of the year.
3. A company may have bought microcomputer equipment on different dates.

But what does it cost companies to acquire computer equipment? The average purchase price by company size and sector of activity is shown in Table 9. It should be noted that these figures may be skewed due to the small size of the sample.

The average cost for all businesses was $35,748, with the median cost being $22,000. In other words, the cost of equipment for half of the companies in our sample was less than $22,000.

Table 9

Average purchase cost (in dollars) of computer equipment[1] by company size and sector of activity

SIZE	COMPANIES			
	SERVICE	SALES	MANUFACTURING	TOTAL
1-19	7,333	6,200	9,500	7,689
20-49	38,100	33,250	45,667	34,900
50-100	100,000	66,000	33,500	65,222
TOTAL	38,179	36,745	30,125	35,748

1. Including peripherals (terminals, monitors, etc.).

The distribution of companies by the purchase cost of equipment reflects the importance attached to microcomputer operations in these companies (see Table 10).

Table 10

Distribution of companies[1]
by purchase price
of computer equipment

PURCHASE PRICE (in dollars)	DISTRIBUTION OF COMPANIES		
	NUMBER	%	CUMULATIVE %
Less than 5,000	3	9	9
5,000 - 9,999	6	18	27
10,000 - 19,999	6	18	45
20,000 - 29,999	4	12	57
30,000 - 49,999	8	25	82
50,000 - 99,999	3	9	91
100,000 and over	3	9	100

1. For companies that responded; of the 39 companies with computer equipment, six were unable to determine the purchase price.

It will be noted that for 57% of these companies, the purchase price of equipment was less than $30,000. In 10% of cases, the cost was greater than $100,000, while for another 10%, it was less than $5,000. Until quite recently, few if any companies could have claimed to have computer equipment costing less than $5,000 or even $10,000. The dramatic decrease in computer prices over the past few years has had a significant effect on the introduction of this technology in small businesses.

Another important element to consider with respect to investing in any resource is what percentage of sales this investment represents. This measurement gives an indication of the relative value of the investment for the organization concerned and for the manager who made the investment. Table 11 shows the breakdown of companies by various levels of investment expressed in percentiles.

Table 11

Total cost of computer equipment
as a percentage of sales
by company size and sector of activity

PERCENTAGE OF SALES	COMPANIES											
	TOTAL		SERVICE		SALES		MANUF.		1-19		20-49		50-100	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
0.00% - 0.24%	7	18	6	33	0	0	1	11	2	20	2	12	3	25
0.25% - 0.49%	2	5	1	6	0	0	1	11	1	10	1	6	0	0
0.50% - 0.74%	6	15	0	0	5	42	1	11	0	0	2	12	4	33
0.75% - 0.99%	2	5	0	0	1	8	1	11	0	0	2	12	0	0
1.00% - 1.49%	5	13	1	6	3	25	1	11	1	10	2	12	2	17
1.50% - 1.99%	4	10	2	11	1	8	1	11	2	20	1	6	1	8
2.00% - 4.99%	8	21	5	28	1	8	2	22	1	10	6	35	1	8
5.00% and over	5	13	3	17	1	8	1	11	3	30	1	6	1	8
TOTAL	39	100	18	101	12	99	9	99	10	100	17	101	12	99
Average	2.80%		3.72%		1.41%		2.81%		4.97%		1.86%		2.33%	
Mean	1.20%		1.72%		0.88%		1.21%		1.72%		1.20%		0.66%	

An examination of this table reveals that the average investment in computer equipment was 2.8% of the company's sales. The mean figure is lower, however (1.2%), which indicates a significant dispersion of companies.

The average figure in fact corresponds to the value of the average amount a company spends on computers, that is, between 2% and 5% of sales. Variations by sector of activity and company size are perhaps even more interesting to study. For example, companies in the service sector invest twice as much on the average as companies in the sales sector. The smallest companies, those with 1 to 19 employees, also invest twice as much, relatively speaking of course, as larger companies with 50 to 100 employees.

We may then formulate the hypothesis that companies in the service sector and the smallest companies devote a larger proportion of their resources to computers. This observation is important, as it denotes, on the part of the small companies that computerize, a strong will to use technology to the fullest in its management activities, this is indicative of innovative, enterprising managers. The other explanation would be that, since the initial cost of computerization is the same for all, the percentage of sales devoted to computers is higher in small businesses where sales figures are lower.

One last element should be mentioned in connection with computer equipment: warranties and service contracts. Two types of warranties were identified: those granted by the supplier and those given by manufacturers. We therefore asked managers to indicate whether a warranty came with the equipment purchased, whether there was a service contract and, where applicable, what was the term of the warranty or service contract.

Table 12 shows managers' responses regarding warranties and service contracts.

If we look at this table, the first thing we note is that, in many cases, managers do not appear to know whether there is a supplier's or manufacturer's warranty attached to the products purchased. This is particularly true in the larger companies.

Table 12

Existence of warranties and service contracts by company size[1]

TYPE OF COMPANY AND MANAGER'S RESPONSE	SUPPLIER'S WARRANTY %	MANUFACTURER'S WARRANTY %	SERVICE CONTRACT %
All companies			
Yes	54	51	69
No	26	15	26
Don't know	21	33	5
1-19 employees			
Yes	70	50	50
No	30	20	50
Don't know	0	30	0
20-49 employees			
Yes	53	47	65
No	24	18	29
Don't know	24	35	6
50-100 employees			
Yes	42	58	92
No	25	8	0
Don't know	33	33	8

1. Calculated as a percentage of the 39 participating companies having computer equipment.

In addition, very few managers (only 5%) were unaware of the existence of service contracts, indicating that managers attach much more importance to this question. Nearly 70% of companies took a service contract, and the modal length of these contracts was one year. But only 54% of company managers mentioned that they had a supplier's warranty, and 51% a manufacturer's warranty. In both cases, the mean term of the warranties was 3 months. One final comment may be made about this table, and this concerns managers themselves: it would seem that managers of smaller companies (1-19 employees) are more aware of the existence of warranties and service contracts than are managers of the larger companies. This might be due to the greater degree of delegation in larger companies. Managers are also much more aware of the

existence of service contracts than of warranties. Could this be because in the first case there is a disbursement, while in the case of the warranty it is part of the purchase price of the equipment? How can managers derive maximum benefit from suppliers' and manufacturers' warranties if they are unaware of their existence?

2.2 Software used in small business

In this section on software, we will deal only with certain technical aspects of software such as source, cost and some features of contracts. Use of this software will be covered in the next section, which deals with the history of applications. Generally speaking software may be divided into three types, depending on its source and availability:

- software produced within the company itself by its own programmers (in-house software);
- software designed by outside specialists or consultants to meet the specific needs of the company (custom software);
- software available on the market, to which no special changes have been made (normally called software packages*).

The relatively simple classification in Table 13 enables us to distinguish between the software packages currently available on the market and software designed to meet the specific needs of a company.

In general, we can see that most businesses use software packages, while a very small percentage of them use software designed in-house. This percentage is found in the group of companies with 50-100 employees, where 50% of

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* For example, software such as Lotus 1-2-3, Wordstar or any software or software package available on the market and designed meet generic needs.

Table 13

Breakdown of companies
by type of software used,
sector of activity
and company size

TYPE OF SOFTWARE	COMPANIES						
	TOTAL %	SERVICE %	SALES %	MANUF. %	1-19 %	20-49 %	50-100 %
Software produced within the company (in-house software)	18	22	8	22	0	6	50
Software custom designed outside the company (custom software)	28	22	42	22	30	29	25
Software packages	82	83	83	78	90	88	67

managers allocated some of the organization's internal resources to software development. In the case of software designed outside the company, size does not appear to be a determining factor, but companies in the sales sector are the major users of this type of software.

The amounts companies invest in the purchase of software packages varies considerably with sector of activity and size, as may be seen in Table 14. For all the companies involved, the average value of software packages purchased exceeds $12,000. This amount is considerably less in the smaller companies (those with 1-19 employees), where it runs about $5,000, compared with $16,000 and more for companies with 20 to 49 employees. It is also interesting to note that the average cost of acquisitions by companies with 20-49 employees is greater than that of larger companies. This might be explained by the fact that software packages can be used effectively in companies with about 40 employees, while in larger companies it is preferable to have them custom-designed.

Table 14

Distribution of companies[1]
by cost of software package acquired,
company size and sector of activity

COST OF SOFTWARE PACKAGES ACQUIRED $	COMPANIES						
	TOTAL %	SERVICE %	SALES %	MANUF. %	1-19 %	20-49 %	50-100 %
Less than 3,000	9	0	11	20	17	8	0
3,000 - 4,999	18	38	11	0	33	8	25
5,000 - 9,999	41	50	33	40	50	50	0
10,000 - 19,999	14	0	11	20	0	0	75
20,000 and over	18	13	33	20	0	33	0
Average cost ($)	12,459	9,500	17,122	8,800	5,150	16,333	11,800

1. For companies where the manager was able to determine the cost of software packages (excluding those companies that obtained their software packages free).

It would appear that it is companies in the sales sector that use the most expensive software packages. For a third of these companies, the purchase price of software packages was greater than $20,000. If we leave aside the companies in this sector, the average purchase price is in the area of $8,000 rather than the approximately $12,500 shown above.

Sixty-nine per cent of managers are aware of the existence of maintenance/updating contracts for the software packages purchased by their company. This percentage rises to 80% and 72% respectively in the case of awareness of the existence of technical support and training contracts. Note that the modal length of training contracts is only one day.

In general, it may be said that company managers are very conscious of training and technical support requirements when purchasing their application software packages.

2.3 History of applications

This last section on the use of computers in the companies studied deals with computer applications. We will first review the applications most commonly used in the companies at the moment, and then look at the chronological order of their implementation.

In Table 15, we show the percentage of companies that have and use the various applications. We can see immediately that most of these applications are of the accounting type, including ledger, accounts receivable, accounts payable, inventory and other operations. Word-processing applications are also very common, particularly in service sector companies and in companies with less than 20 employees. Marketing applications, such as sales analysis, are gradually being implemented, but are as yet a marginal phenomenon. Managers also mentioned many other applications, but their use is proportionately less common (See list in Appendix 6).

There are some variations by sector of activity. Relatively more manufacturing operations use inventory management applications than other companies, and this would seem quite normal. Company size does not appear to be a determining factor, at least in the case of companies with 20-49 and 50-100 employees. The percentages of companies with the various accounting applications are very similar in both groups, with the possible exception of payroll. This would indicate that these two groups of companies have very similar profiles insofar as these applications are concerned.

Table 15

Breakdown of companies
by type of application,
size and sector of activity

TYPE OF APPLICATION	COMPANIES						
	TOTAL %	SERVICE %	SALES %	MANUF. %	1-19 %	20-49 %	50-100 %
Accounting applications							
. ledger	67	56	83	67	60	71	67
. accounts receivable	80	67	100	78	50	94	83
. accounts payable	54	28	83	67	20	59	75
. inventory	54	28	67	89	40	59	58
. payroll	33	33	50	11	20	29	50
. costing	26	33	25	11	30	24	25
. integrated accounting	26	39	8	22	20	24	33
Word-processing	44	61	33	22	80	41	17
Sales analysis	18	11	25	22	0	12	42

Regarding the chronology of applications, that is, the order in which the company introduced the various applications, here again there is a marked predominance of accounting-type applications. As shown in Table 16, in 28% of these companies, the "ledger" application is the first to be introduced. For 28% of companies, accounts receivable was the second application, while for 26% it was the third to be introduced. All the other applications, with the exception of accounts payable, were relatively marginal. The chronological study presented in Table 16 permits us, among other things, to propose a normative model of the order in which applications are introduced in small businesses.

Table 16

History[1] of applications in companies[2] by chronological order of their introduction

TYPES OF APPLICATIONS	CHRONOLOGICAL ORDER		
	1st application introduced %	2nd application introduced %	3rd application introduced %
Accounting applications			
. ledger	28	15	10
. accounts receivable	15	28	26
. accounts payable	0	10	23
. inventory	10	5	8
. payroll	0	3	10
. costing	0	5	5
. integrated accounting	15	5	0
Word-processing	5	5	0
Sales analysis	3	5	3

1. The history is the chronological order of introduction of applications.
2. For computerized companies.

3. Study of perceptions and expectations of managers

Studying the perceptions and expectations of company managers regarding technology and its impacts is a highly complex matter. We must take into consideration such things as the subjectivity related to the perception aspect and the technical, complex nature of the subject itself. It should also be clearly understood that a study of the perceptions of a given situation may yield quite different results from research based on facts. In other words, it is possible that the perception managers have of a given phenomenon may differ significantly from what actually happens. We have nevertheless accepted as our initial hypothesis that the perception managers have of technology and its impacts is fundamental in the organization's ultimate decision to adopt this technology. In the final analysis, it is the manager who accepts or refuses to invest in this type of resource.

To properly grasp the different aspects of managerial perceptions, we propose a model derived from a body of hypotheses and knowledge obtained from works on organizational theory and management information systems. We thus had to find points of correlation between these two fields, which are in any case quite complementary, and propose a series of variables that could measure expectations and perceptions. This model is illustrated schematically in Figure 2.

Figure 2 Conceptual model of research on the perceptions and expectations of managers regarding the introduction and use of computers in their companies

PERCEPTIONS AND EXPECTATIONS OF MANAGERS

I - AT THE ORGANIZATIONAL LEVEL

1. Decision-making process

. Whose idea was it to computerize?
. Who made the decision to introduce computers?
. Who influenced the decision?
. Of what usefulness were the various sources of information?
. On what dates were decisions made?
. Was there a master plan for computerization or cost-benefit analysis?
. What objectives were being pursued by computerizing? Were they met during the first year?

After the first year?

2. Anticipated impacts on organization

. On the organizational structure: did they occur during the first year? After the first year?
. On relations between employees: did they occur during the first year? After the first year?
. On relations between employees and superiors: did they occur during the first year? After the first year?
. On employee duties: did they occur during the first year? After the first year?
. On the number of employees: did they occur during the first year? After the first year?
. On personnel commitment to computerization: did they occur during the first year? After the first year?
. On management responsibilities: did they occur during the first year? After the first year?
. On learning time: did they occur during the first year? After the first year?

PERCEPTIONS AND EXPECTATIONS OF MANAGERS

II - AT THE OPERATIONAL LEVEL

. What functions were envisaged for the computer system? Did these functions become operational during the first year? After the first year?
. Was it envisaged to integrate operations? Was this achieved during the first year? After the first year?
. Were other applications planned? Were they introduced during the first year? After the first year?
. How long did manual and computer systems coexist?

III - AT THE TECHNOLOGICAL LEVEL

. Were expectations regarding hardware met during the first year? After the first year?
. Were expectations regarding software met during the first year? After the first year?
. Were expectations regarding training met during the first year? After the first year?
. Were expectations about hardware suppliers met during the first year? After the first year?
. Were expectations about software suppliers met during the first year? After the first year?
. Were expectations about consultants met during the first year? After the first year?

As its name indicates, this model seeks to determine managers' perceptions and expectations regarding the implementation and use of computers in their businesses. The "time" function is thus important, since managers are asked to state their expectations during the phase preceding implementation and then to describe what happened during the implementation phase, that is, during the first and following years. The question was not phrased so as to explicitly differentiate between implementation and use, but the "time" variable allows us to make some realistic assumptions about this.

It is also essential to clearly understand the scope and justification of the three series of variables: organizational, functional and technological. Organizational variables are mainly concerned with organizational resources. What we want to do here is to determine whether introducing computer technology has modified tasks, relations between employees and the organization's way of operating. The decision-making process leading to computerization is also described in terms of sources of influences and the main individuals or groups responsible for the decision.

Operational variables focus on the functions computer systems are intended to perform; in other words, these are the applications of computers within the company, leaving aside considerations related to the organizational environment and thus the people involved.

Technological variables have to do with the more technical aspects associated with the acquisition of computer hardware and software. Here again, we leave aside the organizational context and the operational aspect.

These three groups of variables are intended to answer a question that is in fact quitte simple:

> **What are the expectations of the company manager regarding technology, its use in the organization and impact on it?**
>
> **Were these expectations met during the first year of implementation or during the following years?**

Let us now go on to analyze the results, respecting the order of the conceptual framework shown in Figure 2.

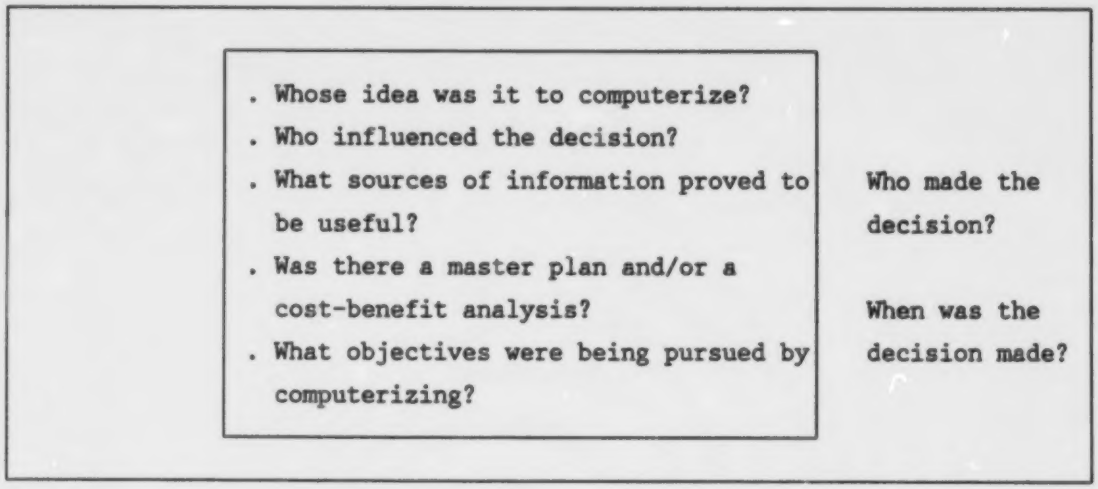
3.1 At the organizational level

In defining the expectations and perceptions of managers with respect to organizational considerations, we wanted to differentiate between the decision-making process that led to the introduction of computers to the company and the impacts of this introduction on certain organizational variables.

3.1.1 The decision-making process

In its simplest form, the decision-making process comprises a series of stages leading to a choice from a certain number of alternatives. In our case, these alternatives were either to computerize or not. Of course, this involves a whole series of questions, but for the moment let us stay with this dichotomous model. To arrive at a choice, decision-makers had to base their decision on a series of stimuli and objectives that would justify their action. These stimuli and objects are part of the pre-decision stage and, in the present case, include the elements presented in Figure 3.

Figure 3 Elements[1] of the decision-making process


. Whose idea was it to computerize?
. Who influenced the decision?
. What sources of information proved to be useful?
. Was there a master plan and/or a cost-benefit analysis?
. What objectives were being pursued by computerizing?
Who made the decision?
When was the decision made?

1. This list is not intended to be exhaustive, but it is useful in that it presents a series of variables that respondents can easily interpret.

Regarding the first question, that is, who first had the "idea" of introducing computers into the company, all respondents with one exception stated that it had been their own idea. It was thus an initiative by the company manager. Who may have influenced the manager during the decision-making process? The answer to this question appears in Table 17.

For all the company managers, groups outside the company proved to be the most important influence in the decision-making process. The most important were, in descending order, the general business environment, consultants, customers and competitors.

Table 17

Degree[1] of influence of various groups on company managers[2] by company size and sector of activity

GROUPS	COMPANIES[3]						
	TOTAL	SERVICE	SALES	MANUF.	1-19	20-49	50-100
Employees	2.45	3.00	2.45	1.50	3.00	2.35	2.30
Suppliers	2.39	2.40	2.36	2.43	2.43	2.19	2.70
Customers	2.73	3.00	2.75	2.39	3.20	2.14	3.57
Competitors	2.54	2.80	2.67	2.00	3.40	2.31	2.38
Consultants	3.04	3.20	2.86	3.00	3.33	2.83	3.17
Gen. environment	3.21	3.38	3.10	3.00	3.13	3.20	3.30

1. Measured on the following scale:

very slight influence	1
slight influence	2
moderate influence	3
strong influence	4
very strong influence	5

2. In the process leading to the decision to introduce computers into the company.

3. For computerized and pre-computerized companies whose managers replied to this question.

This is all the more meaningful when we consider that this profile is the same, with few variations, in all the groups of companies identified. The results are somewhat surprising, insofar as it would have been difficult to predict that the majority of influential groups would be from outside the organization. With the exception of the service sector and very small companies with less than 20 employees, company employees had only a slight influence on the decision. The manager was thus influenced by market forces and conditions in making this decision. It is also interesting to note the role consultants may play in this process.

Another important element, which is in fact related to the foregoing, is the manager's perception of the usefulness of the available sources of information. Table 18 identifies some sources of information and proposes a breakdown of respondents by the source judged the most useful. The results correspond to those above. There is in fact a marked preference for external sources. Managers identified two main sources: 1) consultants and 2) competitors and colleagues. These two sources were by far the most useful: 28% of managers identified consultants as the most useful source, while 21% opted for competitors and colleagues.

Table 18

Breakdown of companies by
the source of information judged most useful[1]
by the company manager

SOURCES OF INFORMATION	COMPANIES[2]											
	TOTAL		SERVICE		SALES		MANUF.		1-19		0-49		50-100	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Newspapers/ magazines	1	3	1	6	0	0	0	0	1	9	0	0	0	0
Trade shows	3	8	2	12	1	8	0	0	2	18	0	0	1	9
Associations	4	10	3	18	1	8	0	0	1	9	2	12	1	9
Consultant	11	28	5	29	3	23	3	33	2	18	7	41	2	18
Supplier	4	10	0	0	3	23	1	11	1	9	3	18	0	0
Customers	2	5	0	0	1	8	1	11	1	9	0	0	1	9
Employees	6	15	2	12	2	15	2	22	1	9	2	12	3	27
Competitors/ colleagues	8	21	4	24	2	15	2	22	2	18	3	18	3	27
No response	5	-	3	-	1	-	1	-	1	-	2	-	2	-
TOTAL	44		20		14		10		12		19		13	

1. Only the sources judged most useful by the manager were used in preparing this table.

2. For computerized and pre-computerized companies.

There are significant variations, however, when we take company size into consideration. For example, no less than 40% of managers of companies with 20-49 employees selected the consultant as the most useful source. Competitors and colleagues also seemed to play an important role, although mainly among managers of larger companies, that is, those with 50-100 employees. Newspapers and magazines, trade shows and associations appeared to be quite marginal sources for managers.

In the decision-making process, one element is often considered of prime importance by management theorists during the pre-decision stage, and that is the cost-benefit study or the master plan. This stage is the formal aspect of a process that would normally lead to a rational choice from a

limited number of alternatives. We therefore wanted to determine whether company administrators and managers made use of the results of such an exercise. The majority of our respondents (over 80%) replied that no studies of this type had been conducted in their organization. It would thus appear that managers depend more heavily on information obtainable from their environment than on analyzes, which they apparently judge to be superfluous. We will come back to this later.

What then are the objectives pursued by managers when computers are introduced? The summary in Table 19 indicates that the first objective pursued by most managers is more speed in information processing. For others, the most important aspect is improvements in certain features of organizational information such as relevance or accuracy of information. For others, it is the possibility of greater control over organizational activities.

Table 19

Distribution of companies by
the objective judged most important
by the manager when deciding
to introduce computers
into the company

OBJECTIVES[1]	COMPANIES						
	TOTAL %	SERVICE %	SALES %	MANUF. %	1-19 %	20-49 %	50-100 %
Increased speed	21	15	14	40	17	26	15
Better information	18	20	14	20	8	21	23
Greater control	14	20	7	10	25	5	15
No response	16	10	29	10	8	21	15

1. Objectives most frequently mentioned by manager.

One interesting question was whether these objectives were achieved following introduction of computers. This is what managers told us:

Table 20

Distribution of company managers by their perception of having attained the objectives established

ATTAINMENT OF OBJECTIVE	COMPANIES						
	TOTAL %	SERVICE %	SALES %	MANUF. %	1-19 %	20-49 %	50-100 %
Objective attained	75	70	86	70	83	79	62
Objective not attained	14	15	7	20	8	11	23
No response	11	15	7	10	8	11	15

In the majority of cases, the objective or objectives appear to have been attained. It was in manufacturing firms and those employing 50-100 persons that a greater proportion of managers stated that the objectives set had not been attained. This might be due to the size of systems and the fact that managers have less time to devote to computerization.

To understand and appreciate to what extent the objective was attained, we asked managers to state, as a percentage, the level of attainment of their objectives.

Table 21

Percentage of companies attaining 100% of their computerization objectives during the first year

OBJECTIVES	COMPANIES						
	TOTAL %	SERVICE %	SALES %	MANUF. %	1-19 %	20-49 %	50-100 %
100% attained	52	55	43	60	58	59	46
No response	7	5	7	10	17	0	8

It will be seen in Table 21 that the majority of company managers stated their objectives were fully attained. Company size appears to be an important factor, since the percentage of companies fully attaining their objectives decreases as company size increases. The explanation given above might also apply here.

On the whole, we may conclude that managers are relatively satisfied, since only 13% of them feel that their objectives were less than 50% attained.

Let us now look at several aspects related to the actual decision to introduce computers. We should mention at the outset that, in all cases, this decision was made by the manager or one of the managers of the companies involved. The initial idea also came from the manager, with one exception. In other words, all the company managers studied, with one exception, were not only the first to have the idea of introducing computers into their companies, they were also responsible for the decision to do so. In our opinion, this reflects the importance managers attach to this operation and the role played by managers in their companies.

3.1.2 Impact on the organization

To measure the impact of the introduction and use of computers in an organization, we asked managers to give us their perception of the impact on three main sets of variables: on the organizational structure, on employees and on the tasks performed by managers.

The results are interesting since, as we will see when we analyze the tables, the manager appears to be unaware of, or perhaps simply indifferent to, the impact computerization has on organizational structure and on employees. When it comes to managers' own responsibilities, they are instead quite forthcoming and provide much more detailed responses.

As we can see in Table 22, managerial perceptions of the first four variables remain relatively stable over time. What managers foresaw before the company computerized varies little from their perception of what happened when computers were introduced. These low rates (in the range of 2) signify that managers foresaw few changes, but perhaps also that they could not imagine what changes were possible. We shall in fact formulate the hypothesis here that managers were unable to predict the impact on structure and employees. The high rate of non-response to this question would tend to confirm this hypothesis. Having a master plan would have been of great help to managers in better estimating this impact. The absence of such a plan in most organizations might explain why managers were unable to adequately respond to these questions.

Table 22
Managers' perception[1] regarding the impact of introducing and using computers on selected organizational variables

ORGANIZATIONAL VARIABLES	COMPANIES[2]							
	TOTAL		SERVICE		SALES		MANUFACTURING	
	before[3]	after[4]	before	after	before	after	before	after
Organizational structure	2.03	2.03	2.22	2.28	1.83	1.58	1.89	2.13
Relations between employees	2.11		2.20		2.20		1.75	
Relations between[5]		2.24		2.13		2.13		2.38
employees and superiors	1.44		1.21		1.42		1.88	
Employee tasks	2.71	2.81	2.67	2.81	2.91	2.67	2.56	3.00
			1 - 19		20 - 49		50 - 100	
			before	after	before	after	before	after
Organizational structure			2.10	2.30	1.88	1.65	2.17	2.30
Relations between employees				2.00		1.94		2.54
Relations between employees and superiors			1.00		1.38		1.82	
Employee tasks			2.40	2.75	2.82	2.77	2.72	2.92

1. Measured according to the following scale:
   1 no change
   2 little change
   3 moderate change
   4 relatively significant change
   5 considerable change.
2. For computerized companies where managers replied to this question.
3. Perception before introduction of computer.
4. Perception after introduction of computer.
5. Manager's perception of interpersonal relations following introduction of computers. The manager was unable to distinguish between the two types of relation.

The only variable that seems to stand out here is that of "employee tasks." It would appear that managers foresaw rather more change here and that this expectation was met. Changes were more extensive than predicted both in the manufacturing sector and in companies with 50 - 100 employees.

How do these predictions translate in terms of impact on the number of employees? Here again, the manager was asked to indicate the impact foreseen before computers were introduced and then to indicate what really happened after this introduction. Table 23 shows the distribution by company size and sector of activity.

Table 23

Managers' perception[1] regarding the impact of introducing and using computers on the number of employees (by company size and sector of activity)

IMPACT ON NUMBER OF EMPLOYEES	COMPANIES[1]							
	TOTAL		SERVICE		SALES		MANUFACTURING	
	before[2] %	after[3] %	before %	after %	before %	after %	before %	after %
Increase	26	34	39	33	18	33	11	38
Decrease	34	26	22	27	36	17	56	38
No change	40	40	39	40	46	50	33	25
			1 - 19		20 - 49		50 - 100	
			before %	after %	before %	after %	before %	after %
Increase			20	22	24	29	36	55
Decrease			40	44	29	12	36	33
No change			40	33	47	59	27	11

1. For computerized companies where managers replied to this question.
2. Perception before introduction of computer.
3. Perception after introduction of computer.

For the companies as a whole, 26% of managers believed that the number of employees would increase, and this increase did occur in 34% of the cases. As well, 34% of companies believed they could reduce the number of employees, but this reduction occurred in only 26% of the cases. On the whole, there would thus appear to be a positive effect on the number of people employed by the companies studied. The most pronounced variations occurred in the service and manufacturing sectors. In the former, a smaller percentage of companies had a decrease in employee numbers, while in the latter a larger percentage of companies experienced a relative increase in employee numbers. In the service sector as well as in the smallest companies, managers' predictions turned out to be fairly accurate. With respect to computer users in these companies, the research results indicate that these are mainly administrative personnel (in 60% of companies). Secretarial personnel are not heavily involved in the process for the moment, as these employees use computers in only 8% of companies. Of the managers themselves, 44% claimed to be computer users; in other words, they knew enough to use the system for management purposes. There are nevertheless significant variations by company size and sector of activity. Thus proportionately more managers of smaller companies use computers than managers of the largest companies (see Table 24).

Table 24

Percentage of managers using computer equipment by company size and sector of activity

	COMPANIES						
	TOTAL	SERVICE	SALES	MANUF.	1-19	20-49	50-100
User	44	28	58	56	70	47	17
Non-user	56	72	42	44	30	53	83

It is the service sector that has the highest proportion of managers who are not computer users, but, on the whole, nearly one out of every two managers perceives himself as a user. A closer examination of the survey results revealed that 71% of managers who had acquired formal knowledge of computers were users, while this percentage was only 38% among those who had no knowledge in the field. It is thus clear that computer training induces managers to use this technology.

But if many managers are users, what is their overall perception of the impact of computers on their own duties?

The answer to this question is given in Table 25. Once again, statistics are presented in such a manner as to permit comparison of managers' perceptions during the two phases of computerization, before and after introduction.

Table 25

Managers' perceptions[1] of the impact of the introduction and use of computers on their administrative duties

MANAGER'S DUTIES	COMPANIES[2]							
	TOTAL		SERVICE		SALES		MANUFACTURING	
	before[3]	after[4]	before	after	before	after	before	after
Planning	3.62	3.72	3.41	3.53	3.58	3.82	4.13	4.00
Routine management	3.81	3.77	3.71	3.65	3.75	3.82	4.13	4.00
Control	3.84	4.08	3.71	4.00	3.92	4.36	4.00	3.89
			1 - 19		20 - 49		50 - 100	
			before	after	before	after	before	after
Planning			3.38	3.78	3.65	3.40	3.75	4.08
Routine management			3.88	4.22	3.82	3.27	3.75	4.08
Control			3.78	4.50	3.94	3.80	3.75	4.08

1. Data measured according to the following scale:

   1 no change in task
   2 little change in task
   3 moderate change in task
   4 relatively considerable change in task
   5 considerable change in task.

2. For computerized companies where managers replied to this question.
3. Perception before introduction of computer.
4. Perception after introduction of computer.

Three task groups were selected: tasks related to planning, those related to current management and those connected with control.

The first observation we can make on the analysis in this table is that managers foresaw fairly significant changes in their tasks compared to the period preceding introduction of computers. It should be noted that these indices are in the order of 4, while they were closer to 3 in the case of employees (Table 22).

In most cases, managers' expectations were met. With the exception of managers of companies employing 20-49 people, managers indicated that their expectations were exceeded. More specifically, tasks related to control were significantly modified for all company groups. This appears realistic bearing in mind that the majority of applications introduced in companies were of the accounting type (see Table 15).

Managers thus seem to perceive that computers have changed their work, and this perception is probably positive, since they would otherwise have refused this change. To conclude this section on organizational impact, let us look once again at an aspect of the impact of introducing computers on employees, that is the learning time required to use this new tool. This is an interesting bit of information for measuring the short-term change caused by the arrival of new technologies.

Table 26

Distribution of companies
by employee time spent
training in computer technology

AVERAGE TIME	DISTRIBUTION OF COMPANIES		
	NUMBER	%	CUMULATIVE %
None	3	9	9
Less than a month	5	15	24
1-3 months	13	38	62
3-6 months	3	9	71
6-12 months	4	12	83
Over 12 months	6	18	101
No response	5	--	

Slightly more than 60% of companies reported training periods of less than 3 months. The mean duration for all companies would thus be less than 3 months, while most would not exceed 6 months. Can we then conclude that, according to managers, employee problems in adapting to this technology are relatively minor? Many of these problems could be due to the use of application software which are designed to be simple to use.

This concludes the section on managers' expectations and perceptions as regarding organizational aspects. We will now look at the operational aspects.

3.2 The operational level

At the operational level, we looked mainly at the activities for which the computer system had been designed, that is, its intended use and actual use. In this regard, managers were asked to cover two aspects, their expectations before the computer technology was acquired and their perceptions of what happened following introduction of the technology. Accordingly, we asked managers three questions:

1. What functions was the computer intended to perform? Which of these actually became operational?

2. Did you think the applications could be integrated? Was this effectively done?

3. Did you think other applications than those currently used could be introduced? Was this done?

These questions cover three important dimensions that must be considered when introducing and implementing EDP systems: the applications planned for the system (the operation(s) it performs), its potential for integration (that is, compatibility between operations), and the possibility of expanding into new applications.

With respect to proposed operations, we can observe from studying the answers given by managers that the results are very similar to those we presented when analyzing the history of applications implementation in Section 3.2.3. Managers were unable to distinguish between operations and applications, and this appears logical in the case of small businesses where the duties and tasks of individuals are closely related to applications.

When asked whether the operations envisaged were actually performed after computers were introduced, 73% of managers answered affirmatively (Table 27). The highest rates of non-implementation of operations are encountered in the largest companies, since over 40% of them report that the operations envisaged were never implemented. This situation might be due to the fact that the systems introduced in large companies are more complex, and it is harder to foresee expectations and results than in the case of applications software, which is designed and tested for certain specific applications.

Table 27

Percentage of functions envisaged by managers which became operational after introduction of computers into the company, by company size and sector of activity

ENVISAGED FUNCTIONS IMPLEMENTED	COMPANIES[1]						
	TOTAL %	SERVICE %	SALES %	MANUF. %	1-19 %	20-49 %	50-100 %
Yes	73	78	70	67	70	87	58
No	27	22	30	33	30	13	42

1. For computerized companies where managers replied to this question.

The second aspect has to do with integration of applications, and thus with the compatibility of the various operations envisaged. Table 28 shows, first, managers' forecasts or expectations and, second, their perceptions as to what degree the integration of applications was achieved.

Table 28

Managers' perceptions regarding integration of applications by company size and sector of activity[1]

Manager believed[2] operations could be integrated	COMPANIES[1]						
	TOTAL %	SERVICE %	SALES %	MANUF. %	1-19 %	20-49 %	50-100 %
Yes	97	100	100	89	100	100	92
No	3	0	0	11	0	0	8
Manager believes[3] operations have been integrated							
Yes	88	71	100	100	75	93	91
No	12	29	0	0	25	7	9

1. For computerized companies where managers replied to this question.
2. Perception before introduction of computer.
3. Perception after introduction of computer.

The majority of managers thought it would be possible to integrate the various applications. These expectations were met in most cases, with the exception of businesses in the service sector, as well as in most of the smallest companies (1-19 employees). It will be recalled that, in the case of these companies, almost all the software used consisted of applications software packages (see Table 13). These programs are easy to use, but are not necessarily compatible with one another, and this might explain the replies of managers of these companies. For service companies, the explanation is more difficult to find, but we might hypothesize that the main difficulty lies in the integration of data processing and word processing. These companies generally make great use of word processing, and the technology does not always allow for integration of these two operations.

Regarding the third aspect, expansion into new applications, variances between managers' expectations and the realization of these expectations are much greater. Eighty per cent of managers of all companies believed they could introduce other applications than those envisaged before the introduction of computers. In fact, this was achieved in only 15% of cases, for an extremely large variance between what was expected and what was achieved (Table 29). In other words, managers expected to do more with computers, and were thus disappointed in their expectations. Once again, it was in the smallest companies that this negative variance seems to have been the greatest, while in businesses in the manufacturing sector, the actual results were much closer to expectations. How can we explain this large variance? There are a number of possible hypotheses: the first would be that managers expected too much, perhaps because of their lack of experience with computer technology, or due to "over-selling" by a supplier or even a consultant.

Perhaps the need for new applications was non-existent, or the use of computers in the company developed at a slower rate than the manager had originally expected. Another cause might be the very high costs related to introducing applications that are more sophisticated than the accounting applications currently available on the market.

Table 29

Managers' perceptions regarding the introduction of new computer applications[1] by company size and sector of activity[2]

Manager believed new applications could be introduced	COMPANIES[1]						
	TOTAL	SERVICE	SALES	MANUF.	1-19	20-49	50-100
Yes	80	89	67	78	90	71	83
No	20	11	33	22	10	29	17
Manager believes new applications have effectively been introduced during last year							
Yes	18	7	9	44	11	14	27
No	82	93	91	56	89	86	73

1. These are applications other than those planned when computer systems were first introduced in the company.

2. For computerized companies where managers replied to this question.

The latter explanation is, we feel, the most realistic, bearing in mind the information obtained from company managers during group interviews. This might also partly explain the disappointment that often accompanies the proliferation of new applications in organizations.

In conclusion, it seems clear that better planning of new applications is necessary, with analysis of their respective benefits and limitations. This necessity is generally covered when preparing the computerization master plan for a business. It is increasingly clear that the absence of such a master plan is a major drawback for many companies, with repercussions being felt in management of both the implementation and use of computers.

3.3 The technical level

Managers' expectations regarding the more technical aspects of the computerization process are difficult to interpret, since we have no way of measuring the extent of the manager's knowledge of this area. Moreover, it was difficult for most people to define their expectations regarding technologies about which they knew little or nothing at the outset. This has an effect on the definition of expectations and the perception of their realization over time.

This section is divided into two parts. The first presents the qualitative results of managers' answers to the question "What are your expectations regarding...?" Next, we provide relative and overall measures of the realization of these expectations, although no attempt is made to relate specific expectations and their realizations. This measure is thus an overall figure, but it is nevertheless satisfactory for the purpose of drawing comparisons between the principal variables.

Expectations were compiled according to six variables:

- hardware
- software
- training
- hardware supplier
- software supplier
- consultant

Insofar as computer equipment was concerned, almost half the managers indicated that they had had no expectations. In our opinion, this is significant and confirms the hypothesis that managers are as yet poorly informed about this technology. For those who answered affirmatively, the main expectations were memory capacity and ease of use. Less frequently mentioned expectations were speed, security of operation and reliability.

Regarding software, the majority of expectations (for about a third of the companies) were related to their flexibility and the possibility of adapting or modifying them to suit the needs of the business. As opposed to expectations about hardware, only six managers indicated that they had had no expectations. Managers are thus more interested in, or less indifferent to, software than hardware.

As in the case of hardware, almost half the managers had no particular expectations about training. This might mean that they did not know whether they were likely or able to obtain any. Only a small percentage of managers (less than 20%) stated that they sought adequate training.

Expectations regarding hardware and software suppliers are quite similar. In both cases, managers were looking for good service. Few of them indicated they had no expectations (less than 10%), and a small percentage of them expected the supplier to have a good reputation.

For all intents and purposes, managers have basically no expectations regarding consultants. It may be that managers in small companies accept the consultant's professional qualities without question and without seeking to express any specific expectations. In other words, "Consultants should know what they are supposed to do."

We propose to conduct our study on whether these expectations were met by taking into account the relative results of the different variables rather than the absolute values attributed to each variable. Table 30 shows how managers perceived the <u>realization</u> of their expectations in terms of all the

variables selected. In examining this table, the variables should be compared with one another rather than attaching too much importance to their absolute values. For example, it might be more interesting to look at the variable "software", that is, the variable for which managers' expectations were relatively less satisfied, than the fact that expectations were entirely met with respect to consultants. Thus the study of one variable in comparison with another allows us to propose a relative order of realization or non-realization.

Expectations least realized	1. software 2. supplier - software 3. supplier - hardware 4. hardware 5. training
Expectations best realized	6. consultant

Table 30

Perceptions of managers
regarding realization of their expectations
as to certain variables
associated with computer technology

VARIABLES ASSOCIATED WITH COMPUTER TECHNOLOGY		COMPANIES[1]						
		TOTAL	SERVICE	SALES	MANUF.	1-19	20-49	50-100
Hardware	: yes	86	100	70	83	89	85	86
	no	14	0	30	17	11	15	14
Software	: yes	81	92	67	86	100	64	89
	no	19	8	33	14	0	36	11
Training	: yes	94	100	83	100	100	89	100
	no	6	0	7	0	0	11	0
Suppliers-hardware	: yes	86	92	80	83	100	75	88
	no	14	8	20	17	0	25	12
Suppliers-software	: yes	83	82	80	100	86	73	100
	no	17	18	20	0	14	27	0
Consultant	: yes	100	100	100	N/A	100	100	100
	no	0	0	0	N/A	0	0	0

1. For computerized companies where managers replied to this question.

This order only suggests that expectations were met relatively more often with respect to consultants than to software. It should be noted that this is not an observation subject to interpretation, since we do not know to what extent expectations were met, and this might constitute a better indication of satisfaction. Moreover, the high rate of non-response to certain variables, including consultant (74% of non-response) and training (54%), might explain their high rank.

Variations by sector of activity and company size are of some interest since, in general, it would appear that managers of companies in the sales sector and those employing 20-49 persons were more critical than the others, particularly with respect to software and software suppliers. Furthermore, these were the two variables that seemed to have the highest rate of dissatisfaction for all groups, and this would tend to confirm the general opinion that software is not yet sufficiently adapted to the needs of companies.

It is surprising, moreover, to see the low degree of criticism managers had for consultants. Some caution might be advisable here since, as we have mentioned, many of them failed to respond to this question, which might indicate that they are unfamiliar with the criteria necessary to evaluate these services.

The final element associated with the technological aspect has to do with the total cost of computerization in the organization. We have placed this table in the technology section since assessing the costs of computerization is linked to knowledge of technology as a consumer product or an organizational resource (intrinsic value) and to knowledge of its impacts on the organization assessed in general terms on the basis of human learning and all forms of interaction between humans and machines. Table 31 proposes a breakdown of the budgeted and actual costs of computer technology (hardware and software) and the impacts on the organization (training, work in parallel, programming and all other costs associated with the implementation of computers in the organization). This enables us to separate investment costs (hardware and software) from operating costs (labor, training); in other words, this gives a fairly complete picture of the true costs of computerization in small businesses.

Table 31

Budgeted and actual costs of computerization
by type of cost and
by company size and sector of activity[1]

TYPE OF COST	COMPANIES			
		TOTAL BUDGET $	ACTUAL $	
Cost of technology[2]		28,367	73,100	
Organizational cost[3]		15,500	32,116	
TYPE OF COST	SERVICE BUDGET $	ACTUAL $	SALES BUDGET $	ACTUAL $	MANUFACTURING BUDGET $	ACTUAL $
Cost of technology	18,538	93,320	35,500	54,458	36,429	63,150
Organizational cost	18,333	12,825	12,500	46,000	9,917	27,329
TYPE OF COST	1 - 19 BUDGET $	ACTUAL $	20 - 49 BUDGET $	ACTUAL $	50 - 100 BUDGET $	ACTUAL $
Cost of technology	12,667	13,000	36,714	45,094	31,857	157,545
Organizational cost	15,667	13,933	8,500	24,496	50,000	140,000

1. For computerized companies where managers replied to this question.
2. Cost of hardware and software.
3. Other costs such as training, work in parallel, internal programming, etc.

Several significant observations may be made regarding this table:

- In general, the actual cost of technology is two and a half times the budgeted cost. In the case of service companies and those with 50-100 employees, the proportion is 5 to 1, while in the smallest companies, it is quite close to 1:1. This indicates that managers in very small companies have made a much more accurate estimate of technology costs.

- The actual organizational cost is generally twice the budgeted cost. Here again, managers in large organizations were less accurate in their budgets than those in small organizations.

- These variances between actual and budgeted costs suggest that managers have considerable difficulty imagining the financial impact of introducing computer technology. This may be due to the absence of master plans and cost-benefit analyses in the companies studied.

- The amounts spent on technology (hardware and software) are twice as large as those related to the organization. This observation is interesting insofar as it contradicts a commonly held opinion that organizational costs are significantly higher than equipment costs. The case of small business seems to be different. We might also formulate the hypothesis that managers did not know how to account for these costs.

- Managers in the smallest companies (1-19 employees) better estimated the expenses they would incur in computerizing their companies. This phenomenon may be due to the fact that the systems implemented were probably less complex than in the case of large companies, and also the fact that managers in small companies are more aware of the internal needs of their organizations. Conversely, it is in the largest companies that there is the greatest difference between the budgeted and actual costs of technology and organizational costs.

These observations quite convincingly illustrate the inability of managers to estimate the true costs of introducing computers in their companies. If these variances were as large for other organizational resources, few companies would survive. This suggests that managers in small business need some means of better estimating their investments in this area. One of these means would be the development of master plans which would cover organizational, operating and technological aspects and their respective costs. This would surely enable companies to narrow the huge variances between budgets and actual results.

3.4 Degree of satisfaction of managers

This section deals with the degree of satisfaction of managers regarding the various aspects of computer systems and the impact of the computerization process on the three main groups of variables described above, organizational, operational and technological.

Table 32

Degree of satisfaction[1] of managers
regarding selected aspects of computer systems
by company size and sector of activity[2]

	COMPANIES						
	TOTAL	SERVICE	SALES	MANUF.	1-19	20-49	50-100
Hardware	4.24	4.29	4.15	4.22	4.45	4.06	4.27
Software	4.21	4.12	4.15	4.44	4.36	4.06	4.27
Training	4.00	4.14	3.69	4.29	4.27	3.87	3.88
Hardware supplier	4.05	4.19	4.17	3.67	4.30	4.00	3.90
Software supplier	4.24	4.00	4.38	4.43	4.27	4.19	4.29
Consultant	4.10	4.33	4.60	3.20	4.75	4.11	3.67

1. Scale of 1 to 5 where 1 = unsatisfied
= very satisfied

2. For computerized companies where managers replied to this question.

Thus, regarding certain specific elements of the computer system, we note in Table 32 that managers in various organizations expressed relatively high degrees of satisfaction. Here again, it is probably more interesting to study these in a relative manner: for example, if we ranked the different variables from least satisfactory to most satisfactory, we would obtain the following classification for manufacturing companies:

Least satisfactory	Consultant	3.20
	Hardware supplier	3.67
	Hardware	4.22
	Training	4.29
Most satisfactory	Software supplier	4.43

The first observation is that there is a relatively large difference between the two extreme values. Consultants obtain only an average rating in manufacturing companies, while software appears to be very satisfactory, which might explain the high degree of satisfaction with the software supplier. Hardware, on the other hand, is relatively less satisfactory, and the hardware supplier even less. There would thus appear to be a correlation between satisfaction with the supplier and satisfaction with hardware or software in manufacturing companies.

We could go on with this type of analysis for the other groups, in particular companies with 50-100 employees, where variations seem to be quite large.

There is another bit of information we could obtain from this table by comparing the various groups. It is clear that managers in small companies with less than 20 employees expressed generally higher degrees of satisfaction than their colleagues in larger companies. This is interesting in itself and might be explained by the higher degree of personal involvement of these managers in the computerization process in their companies and by the less complex nature of the systems used.

The degree of satisfaction of managers regarding organizational, operational and technological variables is shown in Figure 4. All groups of companies are presented for each group of variables. On the x axis we have the degree of satisfaction (1 = dissatisfied and 5 = very satisfied) and on the y axis, the time elapsed (in months) since computers were introduced in the organization. Managers were asked to identify their degree of satisfaction in terms of 6-month periods.

If we examine these 21 graphs, we can make a number of general observations.

- The degree of satisfaction increases over time, suggesting that appreciation is influenced by learning.

- There is an initial period (from 0 to 6 months) during which satisfaction increases. This period corresponds to the introduction period for the technology.

- The initial period is followed by a period of stabilization between the 6th and 18th months. During the period, the organization assimilates the technology, and it is during this period that most of the learning problems develop.

- This period is followed by a phase during which the degree of satisfaction begins to increase. It seems likely that the technology has been assimilated and that the organization is now functioning effectively and efficiently with the help of this technology.

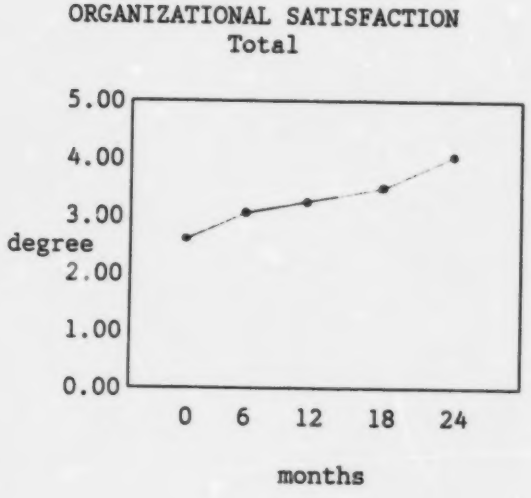
- The degree of satisfaction is relatively higher among managers in smaller companies than among those in the larger companies.

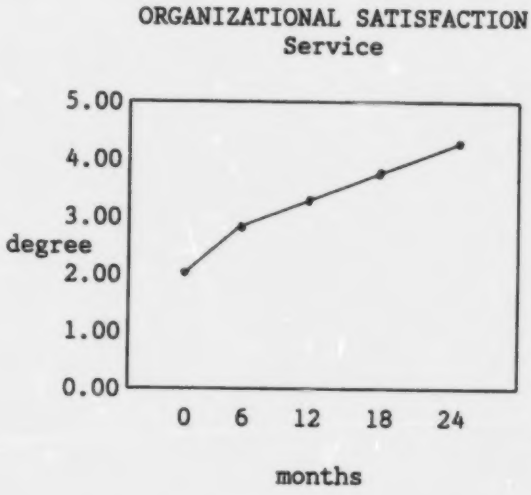
- Managers in the service sector displayed the highest degree of satisfaction compared with the other two sectors.

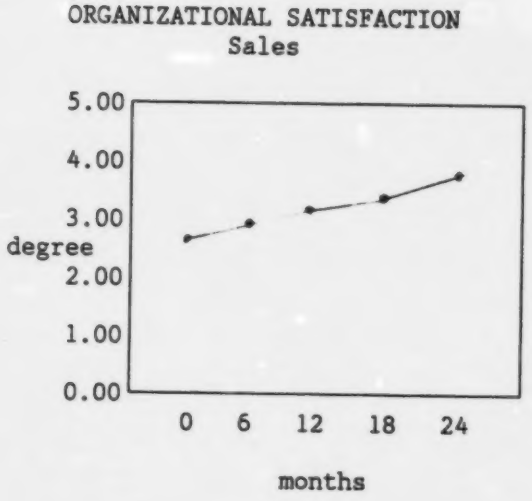
- Managers in manufacturing sector companies indicated the lowest degree of satisfaction of all three sectors.

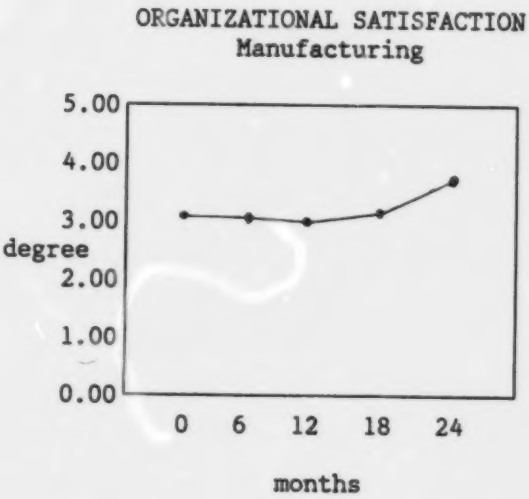
Figure 4 Satisfaction of managers regarding organizational, operational and technological variables depending on the length of time elapsed since implementation of computers and by company size and sector of activity[1]

A) By sector of activity





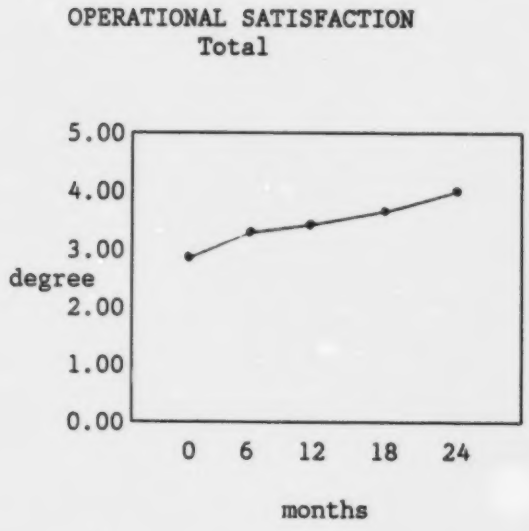


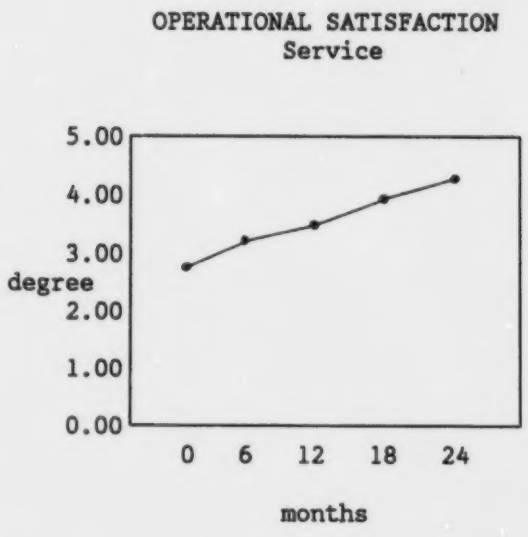


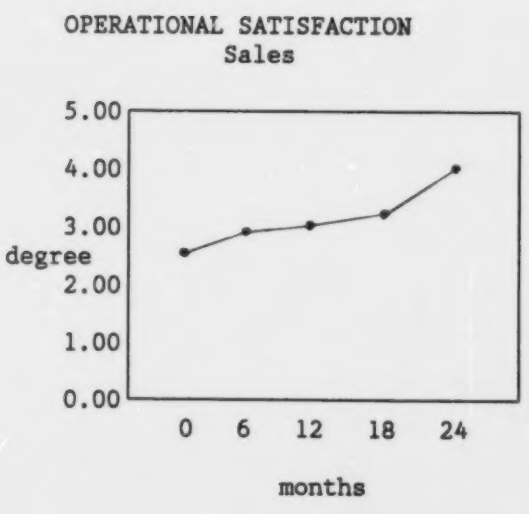
1. For computerized companies where managers replied to this question.

Figure 4 (cont'd.)

A) By sector of activity







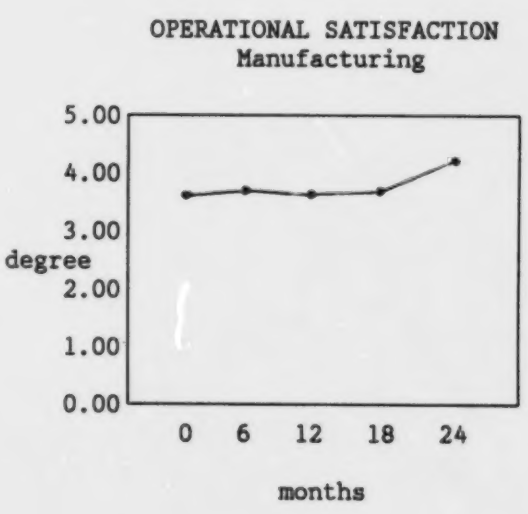
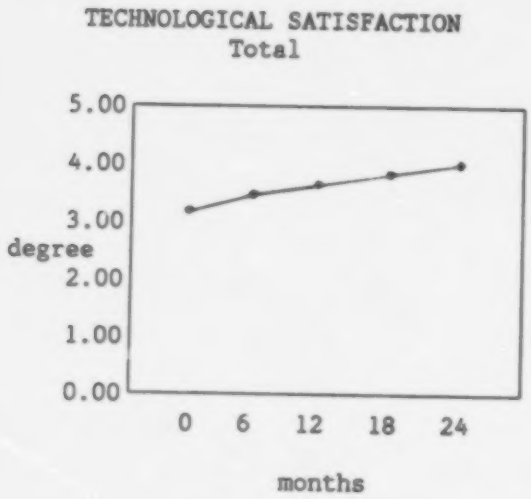
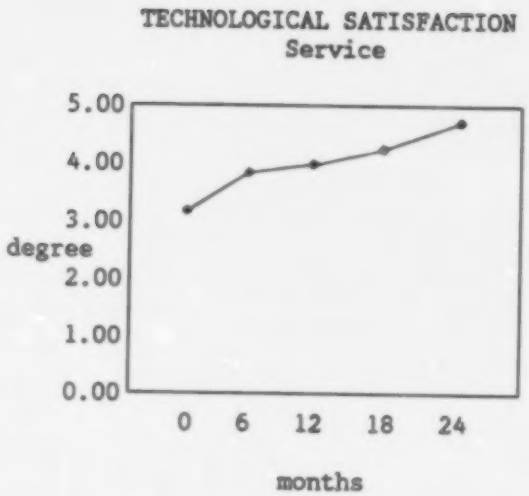
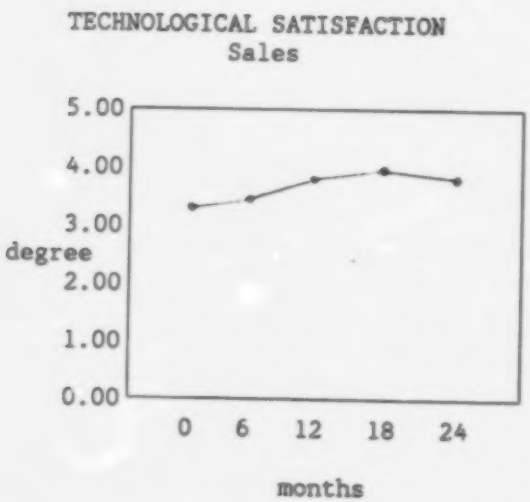


Figure 4 (cont'd.)

A) By sector of activity







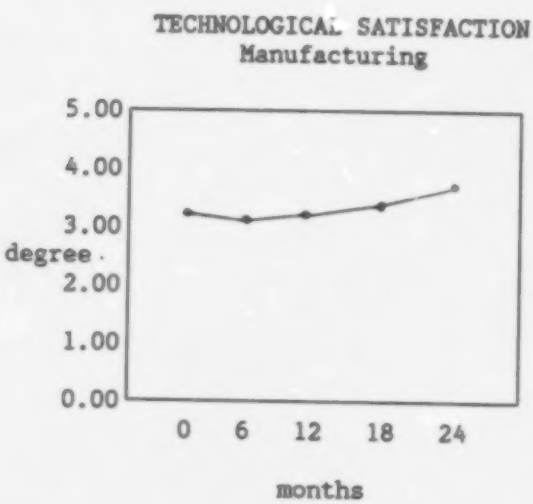
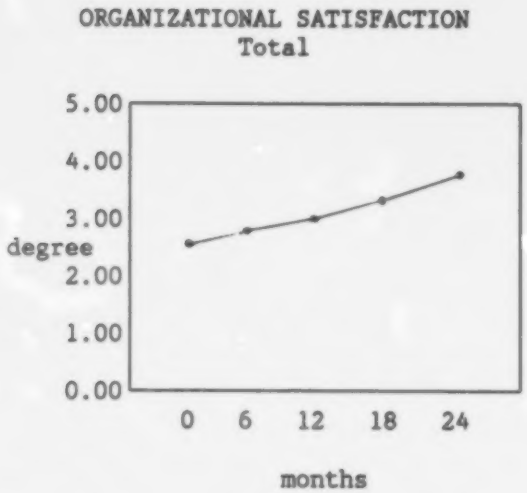
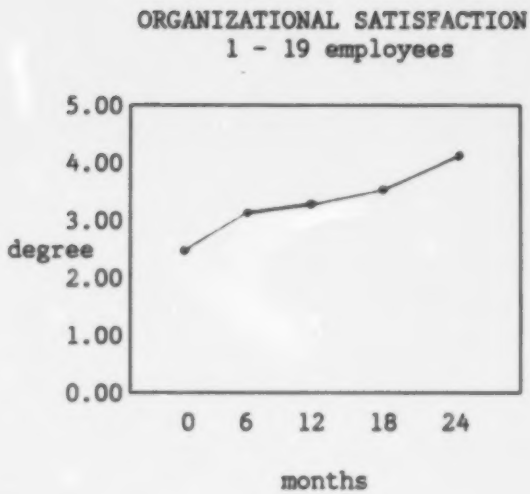
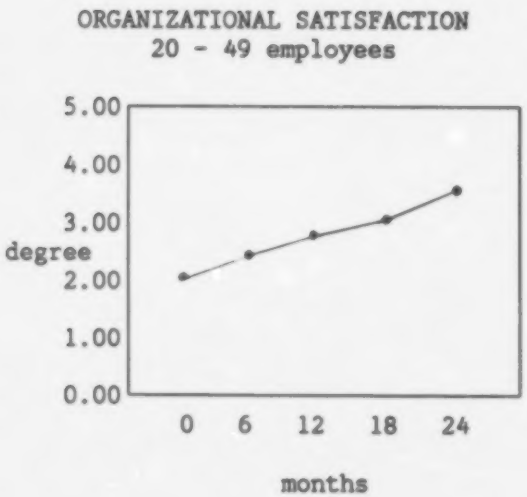


Figure 4 (cont'd.)

B) By company size







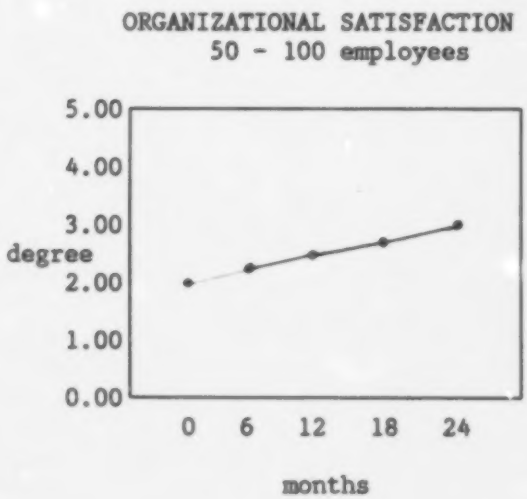
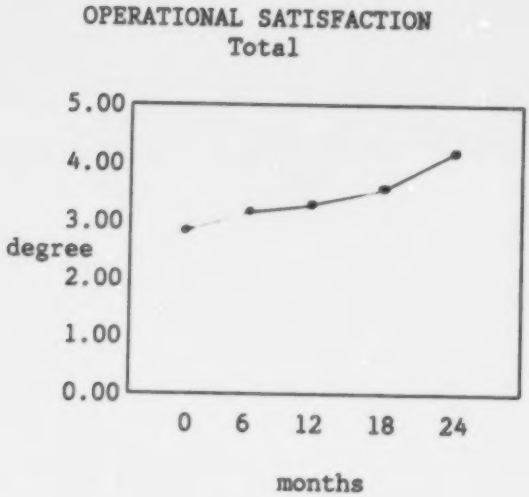
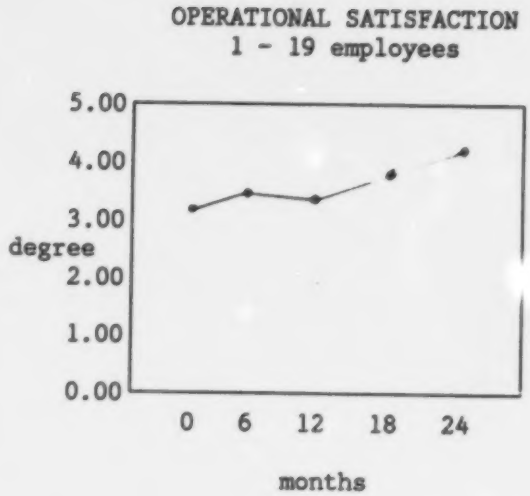
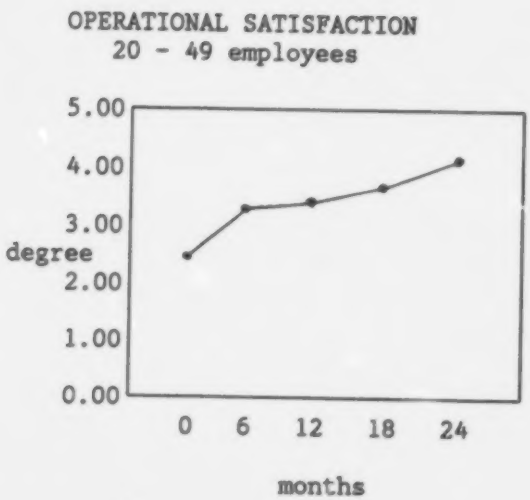


Figure 4 (cont'd.)

B) By company size







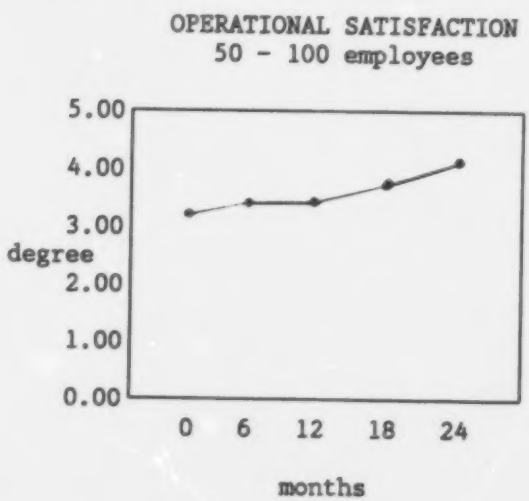
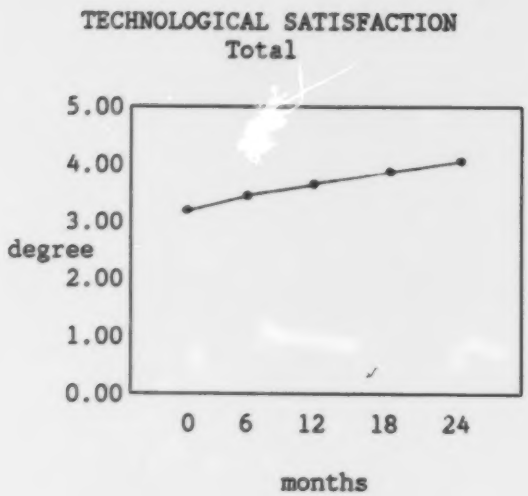
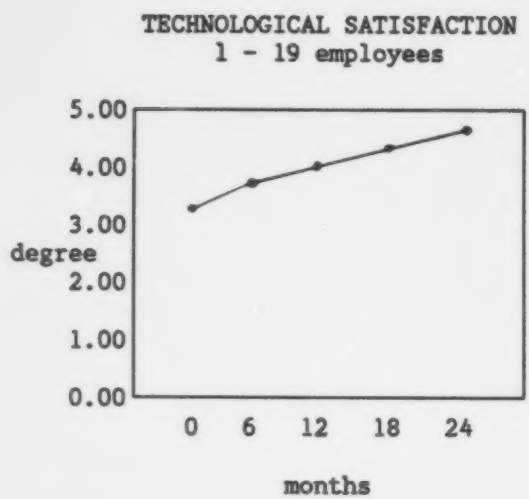
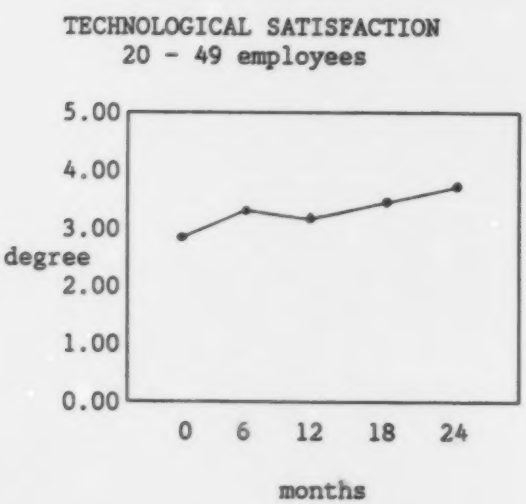


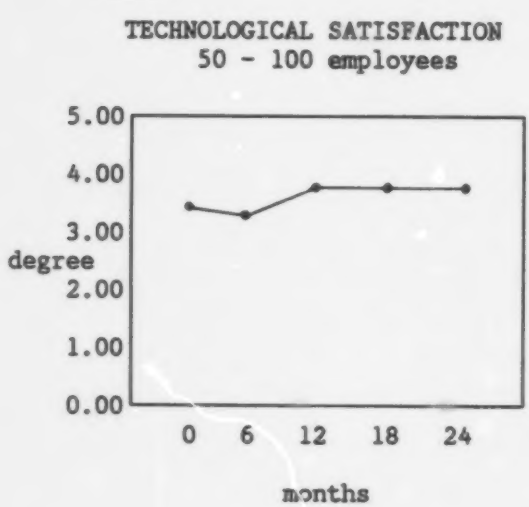
Figure 4 (cont'd.)

B) By company size









An examination of these degrees of satisfaction reveals that they are not stable over time but rather follow a gradual curve characterized by the fact that it is broken rather arbitrarily into three phases:

Phase I - Introduction of technology (familiarization)

- Varies between 1st and 6th month.
- Characterized by a rapidly rising degree of satisfaction; people are becoming familiar with the technology or the tool, and the simplest applications are introduced.

Phase II - Assimilation of technology (learning and breaking in)

- Varies between 6th and 18th month.
- Characterized by less rapidly growing degree of satisfaction; people are learning to use the tool and beginning to convert some more complex management applications.

Phase III - Technology is assimilated (use phase)

- Varies between 12th and 24th month.
- Characterized by a more rapidly growing degree of satisfaction; implementation problems have been solved and the technology is being used for its intended purposes. During this stage, the technology becomes accessible.

It will be noted that we have compiled no statistics past the 24th month, and it is possible that satisfaction rates decline after this point. Data compiled during the group interviews would, however, lead us to believe that it is less a decline than a relative stabilization over time (Phase IV). Periods of decline seem generally to be related to a desire to change or replace technology that has become too old and obsolete (Phase V). The process then begins over again, with Phase I.

What we have learned from this is that the degree of satisfaction rises during the first 24 months following introduction of computers, that satisfaction rates are governed by three and perhaps even five phases, and that they are higher among managers in small companies and those in the service sector.

IV CONCLUSION

1. Positive and negative effects of computerization

One of the general questions we asked managers dealt with their perception regarding the positive and negative effects of introducing computer technology into their companies. If we compile these results for all companies, we obtain an interesting picture of the benefits derived and the difficulties encountered.

Table 33 shows the positive effects that were identified by managers. The two most important positive effects had to do with organizational information and its characteristics (speed, quantity and quality). The third-ranking positive effect is related to the increase in control activities. We may then compare these three elements and the computerization objectives listed in Table 19 and see that the variables are the same. As well, two new elements appear and, despite their low frequency here, they were identified by a large number of managers during group interviews. These are improved quality of working life and a better company image in the eyes of customers. We thus find, on the one hand, a characteristic that has to do with internal operations and interpersonal relations and, on the other, a characteristic associated with an external perception of the company, suggesting that the introduction of this technology influenced customers' perceptions and their confidence in the company. As well, some managers reported seeing an improvement in work quality and increased productivity, and these elements were also mentioned by a great many managers who participated in the group interviews.

Table 33

Managers' perception
of the positive effects of
computerization on their companies

POSITIVE EFFECT[1]	NUMBER OF MANAGERS[2]
Faster information	14
Better information	10
Better control	7
Improvement in QWL[3]	4
Better quality work	3
Increase productivity	3
Better company image[4]	2

1. Elements other than those listed here were identified, but not frequently enough to warrant including them in the table.
2. Managers could identify more than one positive effect.
3. QWL: quality of working life.
4. Improved customer confidence.

The negative effects produced by the introduction of computer technology in business are also interesting since, as mentioned, they reflect problems associated with the introduction and implementation of this technology in organizations. Table 34 gives a list of the negative effects identified by managers. We notice that about a third of managers in computerized companies observed no negative effects. This high degree of "enchantment" is very interesting per se, as well as being highly encouraging. Regarding the negative effects, the first has to do with the difficulties encountered during the implementation and learning period and corresponds to Phase II of the model presented in Section 3.4. The last two elements are inevitable effects associated with any technology, since both dependence and learning occur when technology is introduced into an organization, be it production, transportation or any other type of technology. We may nevertheless attempt to lessen these negative effects by introducing appropriate measures during the introduction and implementation stages.

It should be noted that the results of group interviews confirm these conclusions.

Table 34
Managers' perception
of the negative effects of
computerization on their companies

NEGATIVE EFFECTS[1]	NUMBER OF MANAGERS[2]
None	12
Difficult implementation period	8
Over-dependence on computers	4
Tendency to "play" with machines	2

1. Other elements than those listed here were mentioned, but not frequently enough to warrant including them in this table.
2. Managers could mention more than one negative effect.

2. Some significant results

We would like to briefly discuss some of the results already presented and introduce other results that might contribute to explaining the phenomena observed.

Regarding technology, it should be recalled that 87% of the companies studied had microcomputer equipment and 59% of them operated exclusively with microcomputer technology.

In general, this investment corresponded to nearly 3% of sales. The idea of introducing this technology and the decision to invest in computers came, in almost all cases, from the company manager.

The manager's objectives in introducing computer technology were greater speed, better control and better information.

In over 80% of companies, however, there was no computerization master plan nor any cost-benefit study. This might explain the problems some managers had in explaining their expectations in terms of organizational and operational variables. This will no doubt also explain the variance between budgeted investment and the investment actually made.

This situation led us to determine whether the existence of a master plan might have influenced some variables. In all, seven companies out of 39 indicated that a master plan had been prepared, thus enabling us to study the behavior of these seven companies compared to all the others (32) which had no master plan. The most striking result has to do with the actual and budgeted costs of computerization for the two groups of companies. The variance between the average costs budgeted and the actual costs of the technology in companies with a master plan was about 15%, whereas is was over 200% in companies without such a plan. The same type of proportion is found in connection with organizational costs. This information is clearly very significant and indicates a more realistic formulation of expectations regarding the organization, operations and technology in companies with a computerization master plan. Furthermore, the percentage of expectations met is larger for these companies than for those where there was no master plan (Table 36).

Table 35

Budgeted costs and actual costs of computerization with and without a master plan

COSTS	COMPANIES WITH MASTER PLAN		COMPANIES WITHOUT MASTER PLAN	
	BUDGETED COST $	ACTUAL COST $	BUDGETED COST $	ACTUAL COST $
Technology[1]				
- average	50,000	57,000	25,038	75,783
- median	45,000	40,000	19,000	32,500
Organizational[2]				
- average	15,000	21,667	5,906	16,957
- median	10,000	20,000	0	0

1. Hardware and software costs.
2. Other costs (training, duplicate operations, in-house programming).

Table 36

Percentage of managers[1] claiming satisfaction of expectations regarding certain variables (with and without master plan)

VARIABLES ASSOCIATED WITH TECHNOLOGY	PERCENTAGE OF MANAGERS WHOSE EXPECTATIONS WERE SATISFIED	
	Companies with master plan %	Companies without master plan %
Hardware	71	63
Software	71	66
Training	57	41
Hardware supplier	86	59
Software supplier	42	53

1. For computerized companies whose managers replied to this question.

This seems reasonable insofar as the preparation of a master plan is indicative of greater involvement by all concerned in defining the needs of the organization. As we know, this stage has the effect of ensuring a higher probability that objectives will be attained. Let us see how, in the two cases, the various groups of participants in the computerization process influenced the manager's decision.

The most significant observation we can make from Table 37 is that the degree of influence of employees is greater in companies with a master plan than in those without. It is clear that in developing an implementation strategy, the best course would be to listen to future users. As well, suppliers, that is, salesmen, have less influence in these companies, while their influence in companies without a master plan is significant. Does this mean that the former are better-informed consumers?

Table 37

Degree of influence of various groups involved on the decision to computerize the business

GROUPS INVOLVED	DEGREE OF INFLUENCE[1]	
	BUSINESSES[2] WITH MASTER PLAN	BUSINESSES[2] WITHOUT MASTER PLAN
Employees	3.83	2.08
Suppliers	1.60	2.58
Customers	2.20	3.00
Competitors	2.50	2.65
Consultants	2.80	3.18
Environment	4.14	3.08

1. Measured on the following scale:

very slight	1
slight	2
moderate	3
strong	4
very strong	5

2. For computerized companies whose managers replied to this question.

When we began this research, another hypothesis had been formulated that suggested there might be variations between businesses located in a large urban area and those located elsewhere in Quebec. We therefore compared businesses in the Montreal region with the others. The results yielded no significant differences between the two groups, apart from the fact that for businesses located outside the Montreal area, managers considered the supplier one of the most useful sources of information. It would also appear that geographical proximity is an important criterion in the choice of a supplier. We should also mention that the degree of satisfaction of managers regarding training is higher in the case of Montreal companies, and this may indicate a smaller capacity of qualified personnel for training in areas located outside the greater Montreal region.

One other result should also be noted, since it answers one of our initial questions, as to whether a consultant might have a positive influence on the computerization process in small business. The response to this question is presented in Table 38, where we compare the degree of satisfaction of managers who used the services of a consultant with those of managers who did not.

Table 38

Degree of satisfaction[1] expressed by company managers regarding computerization of the company depending on whether or not a consultant was used

VARIABLES RELATED TO TECHNOLOGY	COMPANIES[2]	
	using a consultant	not using a consultant
Hardware	4.55	4.27
Software	4.18	4.23
Training	4.22	3.89
Hardware supplier	4.40	3.91
Software supplier	4.55	4.21

1. Based on a scale where 1 = little satisfaction
   5 = great satisfaction
2. For computerized companies whose managers replied to this question.

It thus appears that the services of a consultant may favorably influence the manager's degree of satisfaction. This finding seemed important enough to be included in our recommendations.

3. RECOMMENDATIONS

The results of this study enable us to formulate some recommendations for future research projects.

The first recommendation concerns the necessity for small businesses to draw up a master plan prior to introducing computer technology. It has been demonstrated that this step can be useful for small businesses. However, model master plans currently in existence are much more suitable for large

businesses. We accordingly recommend that, in keeping with the second research objective stated at the beginning of the report, research be conducted to identify and define the parameters governing the computerization of small businesses. The parameters should be defined in consultation with company managers and would be integrated into the design and creation of an expert system that would provide interactive assistance to managers of small businesses in preparing and updating their computerization master plans. In this connection, a number of companies have already indicated their interest in participating in such a project. We have selected two companies which seemed to present particularly interesting characteristics (See Appendix 7).

The second recommendation is more far-reaching and is conditional upon the first being followed. Once the expert system for the small business master plan has been developed and tested, it might be interesting to make available to small business the immense resources of business schools, particularly in the form of graduating students, in a program similar to the "Outils de gestion" (management tools) program. Teams of students could be assigned to small businesses in order to provide input into the development of a master plan and the implementation of computerization, since it appears that these two stages currently pose the greatest problems for companies. These students would thus act as "consultants" and might even conduct demonstrations in the use of computers for the companies during the pre-computerization phase.

To ensure some control and follow-up, the scope of this project might initially be limited to the members of an association. We strongly believe that this type of activity, in which we have already acquired a certain experience in Quebec through the "Outils de gestion" program, and which has shown potential for satisfactory results both here and in the United States', might not only be useful, but could also be quite economically beneficial to society in general.

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1. A similar experiment was conducted by the Small Business Institute. See R. S. Lemos, "Microcomputers and the SBI Program."

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APPENDIX 1

Some statistics on small business in Quebec

Table A: Breakdown of Quebec companies by size and sector of activity

Table B: Breakdown of Quebec companies operating on Montreal and Laval Islands

Table C: Breakdown of Quebec companies operating outside Montreal and Laval Islands

Table D: Percentage of Quebec companies using computer equipment, by size and sector of activity

Table A

BREAKDOWN OF QUEBEC COMPANIES
BY SIZE AND SECTOR OF ACTIVITY

SIZE (Number of employees)	SECTOR OF ACTIVITY										
	Manufacturing			Sales			Service				
	Number	% C	% L	Number	% C	% L	Number	% C	% L	TOTAL	%
1 - 19	8,897	64	12	32,561	81	45	31,202	79	43	72,661	78
10 - 25	2,930	21	20	5,706	14	40	5,724	14	40	14,360	15
26 - 49	1,282	9	28	1,530	4	33	1,801	5	39	4,613	5
50 - 99	768	6	35	584	1	25	867	2	40	2,219	2
TOTAL	13,877	-	15	40,382	-	43	39,594	-	42	93,853	100

Source: Inspecteur général des institutions financières, Direction du fichier central des entreprises (1985). Latest update February 15, 1986.

Table B

BREAKDOWN OF QUEBEC COMPANIES
LOCATED OUTSIDE MONTREAL AND LAVAL ISLANDS

SIZE (Number of employees)	SECTOR OF ACTIVITY										
	Manufacturing			Sales			Service				
	Number	% C	% L	Number	% C	% L	Number	% C	% L	TOTAL	%
1 - 19	2,981	54	11	10,522	78	40	12,690	79	49	26,193	75
10 - 25	1,250	23	22	2,061	15	37	2,306	14	41	5,617	16
26 - 49	873	16	41	670	5	32	563	4	27	2,106	6
50 - 99	369	7	34	283	2	26	440	3	40	1,092	3
TOTAL	5,473	-	15	13,536	-	39	15,999	-	46	35,008	100

Source: Inspecteur général des institutions financières, Direction du fichier central des entreprises (1985). Latest update February 15, 1986.

Table C

BREAKDOWN OF QUEBEC COMPANIES
LOCATED ON MONTREAL AND LAVAL ISLANDS

SIZE (Number of employees)	SECTOR OF ACTIVITY										
	Manufacturing			Sales			Service				
	Number	% C	% L	Number	% C	% L	Number	% C	% L	TOTAL	%
1 - 19	5,916	70	12	22,040	82	43	18,512	78	40	46,468	79
10 - 25	1,680	20	19	3,645	14	42	3,418	15	39	8,743	15
26 - 49	409	5	16	860	3	34	1,238	5	49	2,507	4
50 - 99	399	5	35	301	1	27	427	2	38	1,127	2
TOTAL	8,404	-	14	26,846	-	46	23,595	-	40	58,845	100

Source: Inspecteur général des institutions financières, Direction du fichier central des entreprises (1985). Latest update February 15, 1986.

Table D

PERCENTAGE[1] OF QUEBEC COMPANIES USING COMPUTER EQUIPMENT, BY SIZE AND SECTOR OF ACTIVITY

SIZE (Number of employees)	SECTOR OF ACTIVITY		
	Manufacturing %	Sales %	Service %
1 - 19	42	50	68
20 - 50	56	75	95
50 - 99	75	95	93

[1] Calculated as a percentage of the total population of respondents in each group.

Source: Study conducted in June 1985 by L.A. Lefebvre, E. Lefebvre and J. Ducharme, Université du Québec à Montréal, on 844 Quebec companies (see Revue Internationale de Gestion, November 1985).

APPENDIX 2

List of Managers who Participated in the Study

CONFIDENTIAL

APPENDIX 3

QUESTIONNAIRE

COMPUTERIZATION
AND THE SMALL BUSINESS

FINAL VERSION

PART 1 - DESCRIPTIVE STUDY

1. Identification of manager

- name: _____
- business telephone: _____
- present position held since: _____
- training
  . general training: _____
  . formal computer-related training: _____

2. Identification of company

- name: _____
- address: _____
- date formed
  . company exists since: _____
- nature of activities:
  . service sector, specify: _____
  . sales sector, specify: _____
  . manufacturing sector, specify: _____
- legal status
  . sole proprietorship
  . partnership or organization
  . business corporation
  . cooperative
- profit-making _____ non-profit _____
- current number of full-time employees: _____
- current number of part-time employees: _____
- current number of full-time office employees: _____
- current number of part-time office employees: _____
- annual sales: _____

$0 - 99,000	$1,000,000 - 4,999,999
$100,000 - 249,999	$5,000,000 - 9,999,999
$250,000 - 499,999	$10,000,000 and over
$500,000 - 999,999	

3. History of computerized management in the company

3.1 Chronological list of computer applications (in the form of a histogram)

	NATURE OF APPLICATIONS	DATE OF INTRODUCTION
1st		
2nd		
3rd		
4th		
5th		
6th		
7th		
8th		

3.2 List of equipment (hardware)

Qty	Supplier	Brand & model	Purchase/ Lease Cost	Acquisition Date

Details of equipment contract:

	yes	no		
- supplier guarantee(s)	—	—	period:	
- manufacturer's guarantee(s)	—	—	period:	
- service contract(s)	—	—	period:	

3.3 List of software

	yes	no
- Do you use programs developed in-house?	—	—

If so, give for each application:

. name of application: _____
. purpose of application: _____
. time spent: _____
. development cost: _____
. maintenance cost: _____

- Do you use programs developed outside specifically for the company ("custom software")? yes no — —

If so, give for each application:
. name of application: _____
. purpose of application: _____
. development cost: _____
. maintenance cost: _____
. name of organization that developed application: _____

- Do you use programs or software packages available on the market? yes no — —

If so, give for each application:
. name of application: _____
. purpose of application: _____
. cost: _____
. name of supplier: _____
. details of contract for software:

	yes	no	
- maintenance/updating	—	—	period: _____
- technical support	—	—	period: _____
- training	—	—	period: _____

APPENDIX 3

PART 2 - STUDY OF PERCEPTIONS AND EXPECTATIONS

1. ORGANIZATIONAL

a) Decision-making process

1.1 Whose idea was it to introduce computers?
position: _____
approximate date: _____ ?
date of decision: _____

1.2 Which individuals in the organization participated in this decision

POSITION	CONTRIBUTION
_____	_____
_____	_____
_____	_____
_____	_____

1.3 Was there a written statement describing the strategy for introducing computers (master plan or equivalent)?

yes	no
—	—

Brief description: _____

1.4 What was the basic objective in introducing computers?

_____

Was this basic objective attained during the first year?

yes — no —

If so, to what extent? _____

Was the basic objective attained after the first year?

yes — no —

If so, to what extent? _____

1.5 Was there a cost-benefit analysis? yes — no —

If so, what were the expected benefits?

_____

If so, what were the expected costs?

_____

1.6 Identify the degree of influence each of the following had on your decision.

	Very slight	slight	moderate	strong	Very strong	N/A
Employees	1	2	3	4	5	0
Supplier(s)	1	2	3	4	5	0
Customer(s)	1	2	3	4	5	0
Competitor(s)	1	2	3	4	5	0
Consultant(s)	1	2	3	4	5	0
General environment	1	2	3	4	5	0
Other(s) _____	1	2	3	4	5	0

1.7 Indicate, in descending order, the three sources of information you found most useful.

__ newspapers and magazines

__ trade shows (e.g. small business and computer shows), conferences and fairs

__ associations

__ consultants

__ suppliers

__ customers

__ employees

__ competitors/colleagues

b) Impact on the organization

Scale:
1 no change
2 little change
3 moderate change
4 fairly significant change
5 great change
0 n/a

	DURING THE FIRST YEAR	AFTER THE FIRST YEAR
2.1 Before introducing computer technology, did you think that		
a) the organizational structure would be: 1 2 3 4 5 0	a) the organizational structure was: 1 2 3 4 5 0	a) the organizational structure was: 1 2 3 4 5 0
If changed, in what way? _____ _____		
b) relations between employees would be: 1 2 3 4 5 0	b) interpersonal relations were: 1 2 3 4 5 0	b) interpersonal relations were: 1 2 3 4 5 0
If changed, in what way? _____ _____		

c) relations between employees and superiors would be:

1 2 3 4 5 0

If changed, in what way?

_____ __

_____

DURING THE FIRST YEAR

AFTER THE FIRST YEAR

d) employee duties would be:

1 2 3 4 5 0

If changed, in what way?

_____

_____

d) employee duties were:

1 2 3 4 5 0

d) employee duties were:

1 2 3 4 5 0

	DURING THE FIRST YEAR	AFTER THE FIRST YEAR
e) the number of employees would increase or decrease? By how many positions and for which duties?	e) the number of employees increased or decreased. By how many positions and for which duties?	e) the number of employees increased or decreased. By how many positions and for which duties?
f) the number of employees directly involved in computer applications would be large. How many and for which duties?	f) the number of employees directly involved in computer applications was large. How many and for which duties?	f) the number of employees directly involved in computer applications was large. How many and for which duties?

	DURING THE FIRST YEAR	AFTER THE FIRST YEAR
2.2 Before the introduction of this technology, did you think that some aspects of your job would be changed?		
- Planning:	- Planning:	- Planning:
1 2 3 4 5 0	1 2 3 4 5 0	1 2 3 4 5 0
- Routine management (day-to-day activities)	- Routine management (day-to-day activities)	- Routine management (day-to-day activities)
1 2 3 4 5 0	1 2 3 4 5 0	1 2 3 4 5 0
- Control (monitoring activities)	- Control (monitoring activities)	- Control (monitoring activities)
1 2 3 4 5 0	1 2 3 4 5 0	1 2 3 4 5 0

2.3 How much time did your employees spend learning the new technology?

2.4 Attempt to determine whether the manager is a primary user.

	DURING THE FIRST YEAR	AFTER THE FIRST YEAR
2. OPERATIONAL LEVEL		
1. What operations were envisaged?	1. Did all the operations envisaged become operational? Yes ____ No ____ If not, which ones did not become operational? _____	1. Did all the operations envisaged become operational? Yes ____ No ____ If not, which ones did not become operational? _____
2. Did you think that these applications could be integrated? Yes ____ No ____ If so, which ones? _____	2. Were some of the operations actually integrated? Yes ____ No ____ If so, which ones? _____	2. Were some of the operations actually integrated? Yes ____ No ____ If so, which ones? _____

	DURING THE FIRST YEAR	AFTER THE FIRST YEAR
3. Did you plan to introduce other applications than those currently in use? Yes ____ No ____ If so, which ones? _____	3. Were some of these applications actually introduced? Yes ____ No ____ If so, which ones? _____	3. Were some of these applications actually introduced? Yes ____ No ____ If so, which ones? _____
4. How long did the computerized and manual systems operate in parallel?		

	DURING THE FIRST YEAR	AFTER THE FIRST YEAR
3. TECHNOLOGICAL LEVEL		
1. What were your expectations regarding: a) hardware _____ b) software _____ c) training _____	1. Were these expectations met regarding: a) hardware Yes ____ No ____ If not, what were the problems? _____ b) software Yes ____ No ____ If not, problems _____ c) training Yes ____ No ____ If not, problems _____	1. Were these expectations met regarding: a) hardware Yes ____ No ____ If not, what were the problems? _____ b) software Yes ____ No ____ If not, problems _____ c) training Yes ____ No ____ If not, problems _____

	DURING THE FIRST YEAR	AFTER THE FIRST YEAR
d) hardware supplier service: _____ maintenance: _____	d) hardware supplier Yes ____ No ____ If not, problems _____	d) hardware supplier Yes ____ No ____ If not, problems _____
e) software supplier _____	e) software supplier Yes ____ No ____ If not, problems _____	e) software supplier Yes ____ No ____ If not, problems _____
f) consultant _____	f) consultant Yes ____ No ____ If not, problems _____	

2. If there was a problem, who solved it or where did the information come from?

   a) hardware: _____

   b) software: _____

PART 3 - SYNTHESIS

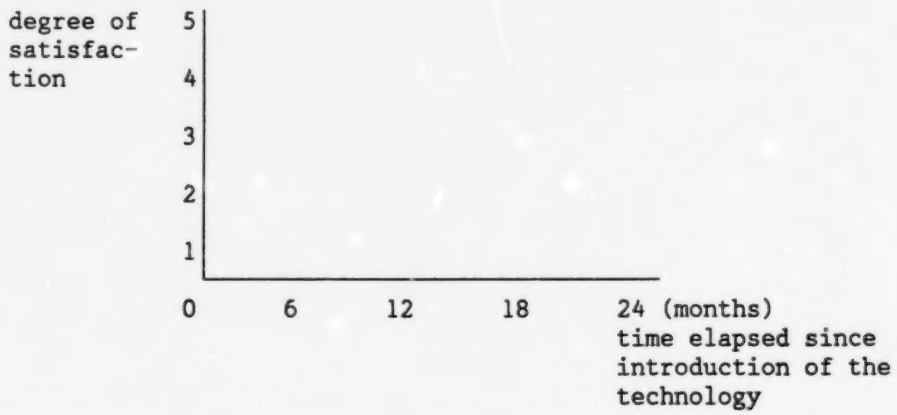
1. What are the positive and negative effects of introducing computer technology?

_____

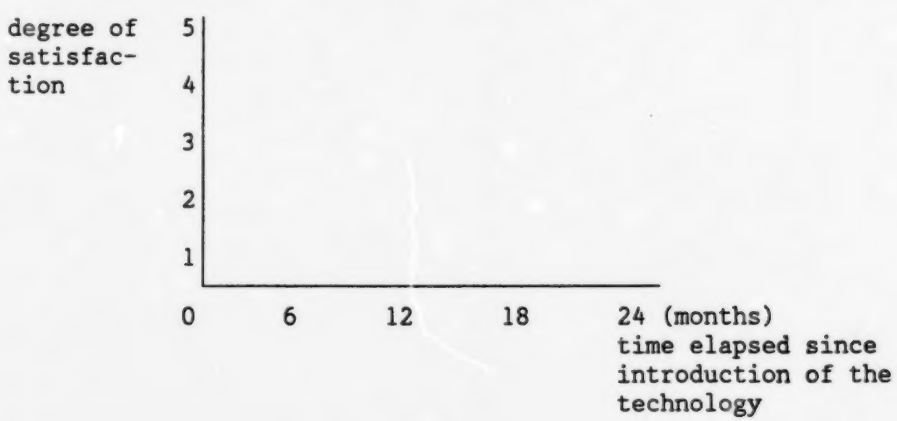
_____

2. Indicate your general level of satisfaction
(1 = dissatisfied, 5 = very satisfied)

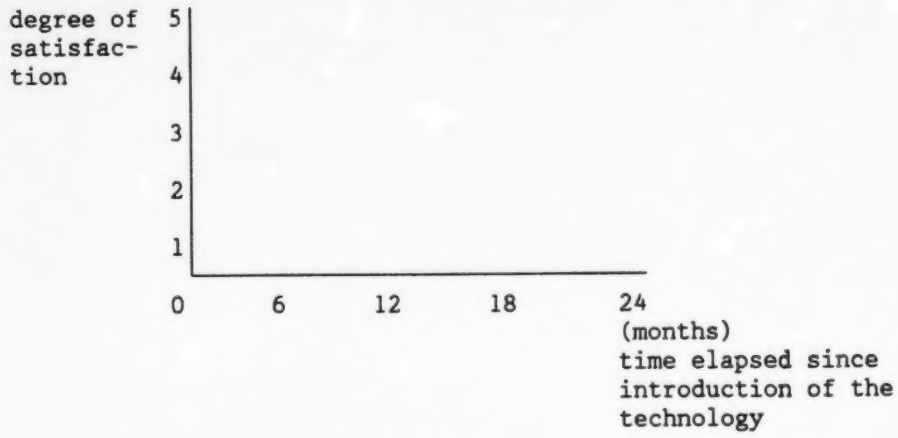
a) on the organizational level (structures, job duties, interpersonal relations)



b) on the operational level (application operations and programs)



c) on the technological level (hardware, software)



3. In general, what is your degree of satisfaction on a scale of 1 to 5 (1 dissatisfied, 5 very satisfied) for:

a)	hardware	1	2	3	4	5	N/R
b)	software	1	2	3	4	5	N/R
c)	training	1	2	3	4	5	N/R
d)	hardware supplier	1	2	3	4	5	N/R
e)	software supplier	1	2	3	4	5	N/R
f)	consultant	1	2	3	4	5	N/R

4. Before introducing computer technology, what was your estimate of the total cost of computerization?

- equipment cost: _____
- organization cost: _____

What was the actual cost?

- equipment cost: _____
- organization cost: _____

What were the intangible benefits of computerization? (e.g. faster or more effective decision-making, employee satisfaction)

_____

_____

E) COMMENTS

_____

_____

_____

_____

THANK YOU FOR YOUR COOPERATION!

APPENDIX 4

LIST OF EQUIPMENT

(in alphabetical order)

MICROCOMPUTERS

Alpha Micro
Apple Macintosh
Apple 2C
Compact Desk D50
Digital PDP11
HP 86
IBM PC
IBM PC Junior
IBM PC XT
IBM PC AT
Infiny XT
MICRO-COM
MIT 2
Monroe
NCR TANNER
NEC
Olympia People
Philips
Tandy 1200 HP
Tandy 2000
TRS 80 MODEL 4
TRS 80 PORTABLE
XEROX 6035
XEROX
ZENITH 100

MORE SOPHISTICATED EQUIPMENT

BASIC 4
CANTEL SYSTEM 20
DIGITAL PDP 11-23
DIGITAL PDP1-70
HP 637
HP 500
HP 3000
IBM 23
IBM 36
NCR 93100
REXON RX 400
SMS

WORD-PROCESSING SYSTEMS

AES
AES ALPHA + 12
OLIVETTI ETV 300, ETV111
MICOM
MICOM 3000
XEROX

APPENDIX 5

LIST OF SUPPLIERS

(in alphabetical order)

HARDWARE SUPPLIERS

AES
CANTEL
CELIBEC
CENTRE D'INFORMATIQUE ST-JÉRÔME
C.I.B.E.M.
CLAVIGRAMME
COMPUCENTRE
COMPUTERLAND
EQUIPEMENTS DE BUREAU ST-EUGENE
FUTUR BYTE
G.L. ORDINATEUR
HEWLETT PACKARD
I.S.I.
I.S.T.
JOCELYN DIONNE INC.
JOLIDATA
MAISON CERTIE
MICOM
MONROE
NCR
OLIVETTI
OLYMPIA
PROLOG
QUASIMODO
RADIO SHACK
SMS
SYSTEMHOUSE
XEROX

APPENDIX 5

SOFTWARE SUPPLIERS

AES
ASSOCIATION OF OPTOMETRISTS
CENTRE D'INFORMATIQUE ST-JEROME
C.I.B.E.M.
C.O.N.S.A.
FONTAINE INC.
G.L. ORDINATEUR
HEWLETT PACKARD
H.I.S.
I.S.I.
I.S.T.
JOCELYN DIONNE INC.
LABORATOIRE DESCHAMPS
L.A.R.S.
M.A.I.
MAISON CERTIE
MATHEMA
MICOM
MIRCOCODE
MONROE
NCR
ORDINOGRAMME
P.D.S. (CANADIAN TIRE CORP.)
PROB SCIENTIFIC
PROLOG
QUASIMODO
RADIO SHACK
RAYMOND, CHABOT, MARTIN, PARE & ASSOCIES (RCMP)
S.A.P.I.
SYSTEMHOUSE
XEROX

APPENDIX 6

LIST OF COMPUTER APPLICATIONS LESS FREQUENTLY MENTIONED BY MANAGERS

(in alphabetical order)

	Frequency
Pension plan administration	1
Replacement cost calculation	1
Individual income tax calculation	1
Corporate income tax calculation	3
Technical calculations	4
Work distribution	1
Property evaluation	2
Budget planning	1
Project planning	4
Customer complaints	2
Reservation system	1

APPENDIX 7

BRIEF DESCRIPTION OF TWO COMPANIES WHOSE MANAGERS INDICATED INTEREST IN PARTICIPATING IN AN IMPLEMENTATION EXPERIMENT IN A CONTROLLED ENVIRONMENT AND USING A PARTICIPATIVE MODE

. One company operating in the service sector:

NAME WITHHELD

. One company operating in the manufacturing sector:

NAME WITHHELD

During a study conducted in April and May 1986, the managers of these two companies were planning to introduce computers in their companies in the very near future, that is, May and June 1986. The first company did not have a master plan, while the second had prepared one.